FAPESP
THE STATE OF SÃO PAULO
RESEARCH FOUNDATION

Translating Research into Business

Ten years promoting technological innovation

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Ten years promoting technological innovation

Projects supported by FAPESP in the Partnership
for Technological Innovation and
Technological Innovation in Small Businesses Programs

FAPESP
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Advancement of Knowledge with Development of the Economy

Over the last 50 years, Brazil has developed a competitive academic capability in the activities of the advancement of knowledge and the training of human resources. There has been a six-fold increase in scientific production since 1980 – a rate of growth well above the world average –, whilst the highly successful state drive to support post-graduates over this period nowadays enables the qualification of 9 thousand new PhDs each year. All of this indicates the existence of an academic base comparable to that of many member countries of the Organization for Cooperation and Economic Development (OCDE), which derives from the complementary drive of research support agencies such as the National Council for Scientific and Technological Development (CNPq), the Coordination for the Training of University Personnel (Capes), the Financier of Studies and Projects (Finep) and from state research support foundations including the State of São Paulo Research Foundation (FAPESP). This base enables the country to meet with increased chances of success, the enormous challenge of introducing research activity into businesses, bringing an increase in technological competitiveness and in the capacity for innovation.

FAPESP, one of the main support agencies for scientific and technological research in Brazil, has played a key role in this endeavor to engage the academic base by means of the training of human resources and cooperative projects, with Research and Development (R&D) in the business world. Just over ten years ago, the Foundation's programs geared towards Technological Innovation began to produce a revolution in the way scientific and technological research was financed in Brazil, as well as obtaining results of high impact in very competitive areas. Brazilian scientists, in partnership with national and transnational technology-based companies, developed original projects which resulted in innovations with a potential for competing with technologies produced in the great world centers. Some examples of this are synthetic diamond drill bits for use in dentistry, advanced devices for fiber optical communication, technology for the early and more accurate diagnosis of skin cancer, a new type of fibrocement to replace asbestos, or improvements in the control and planning strategies of the operation of oil refineries which resulted in tens of millions of dollars in benefits.

FAPESP's first initiative in the direct funding of innovation occurred at the end of 1994, when it decided to put into practice a program for research projects, which in addition to supporting the training of researchers and the creation of knowledge, also sought its dissemination and application, facilitating the interactions for the transformation of knowledge into wealth.

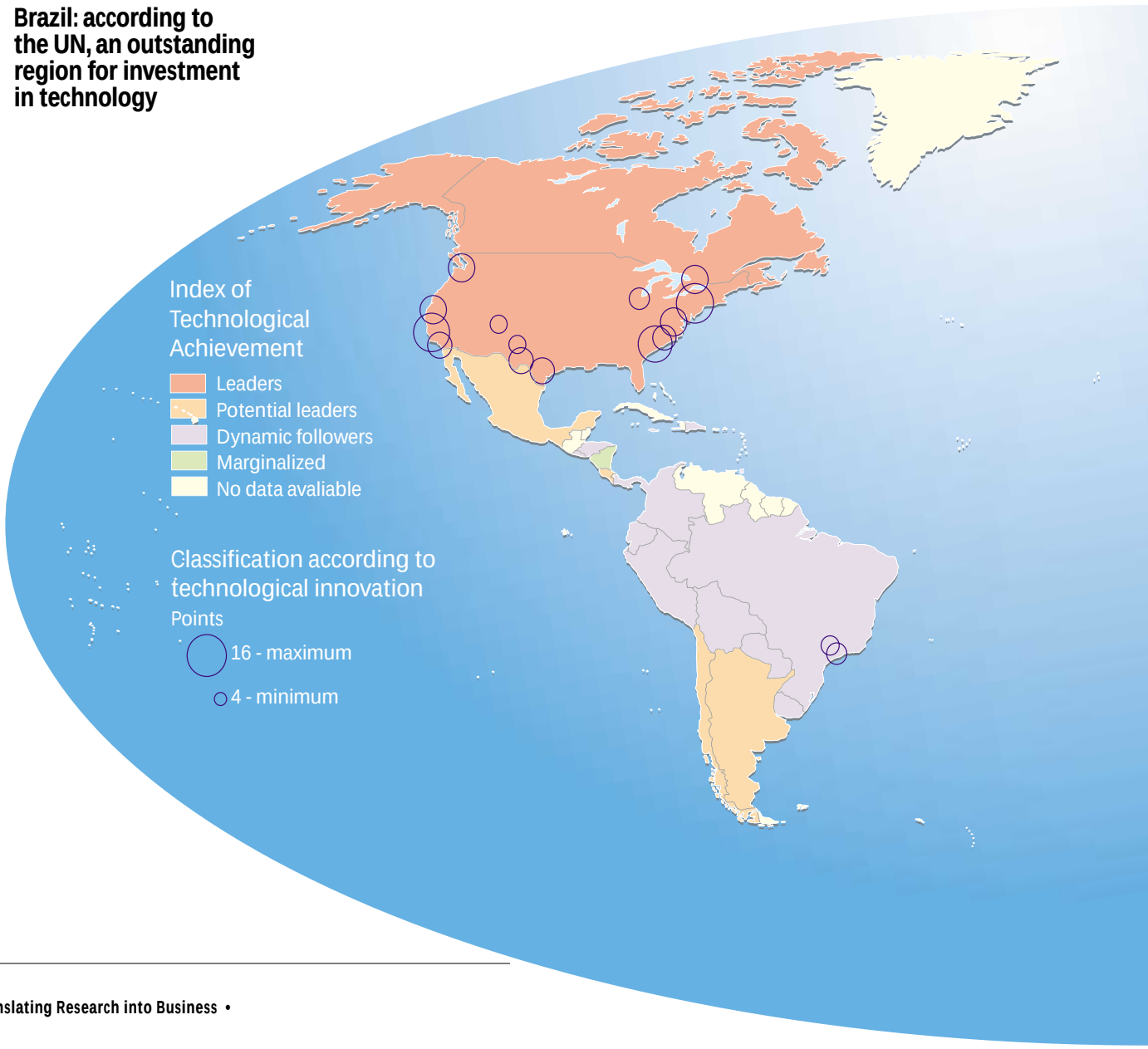
In tune with society's wishes, FAPESP accepted the challenge of adding to its mission to promote scientific research, the commitment to creating opportunities to support economic development, financing research projects created and developed in partnership between academic institutions and private enterprise. The concern was to engage the academic sector's research offer with the demand from the business sector. The main novel-

ty was the requirement for a partner business that demonstrated real interest in the transfer of technology which the project proposed to create. With risks and costs shared, this would also guarantee the possibility of overcoming prejudices in the relationship between the academic and business environments.

Backing businesses

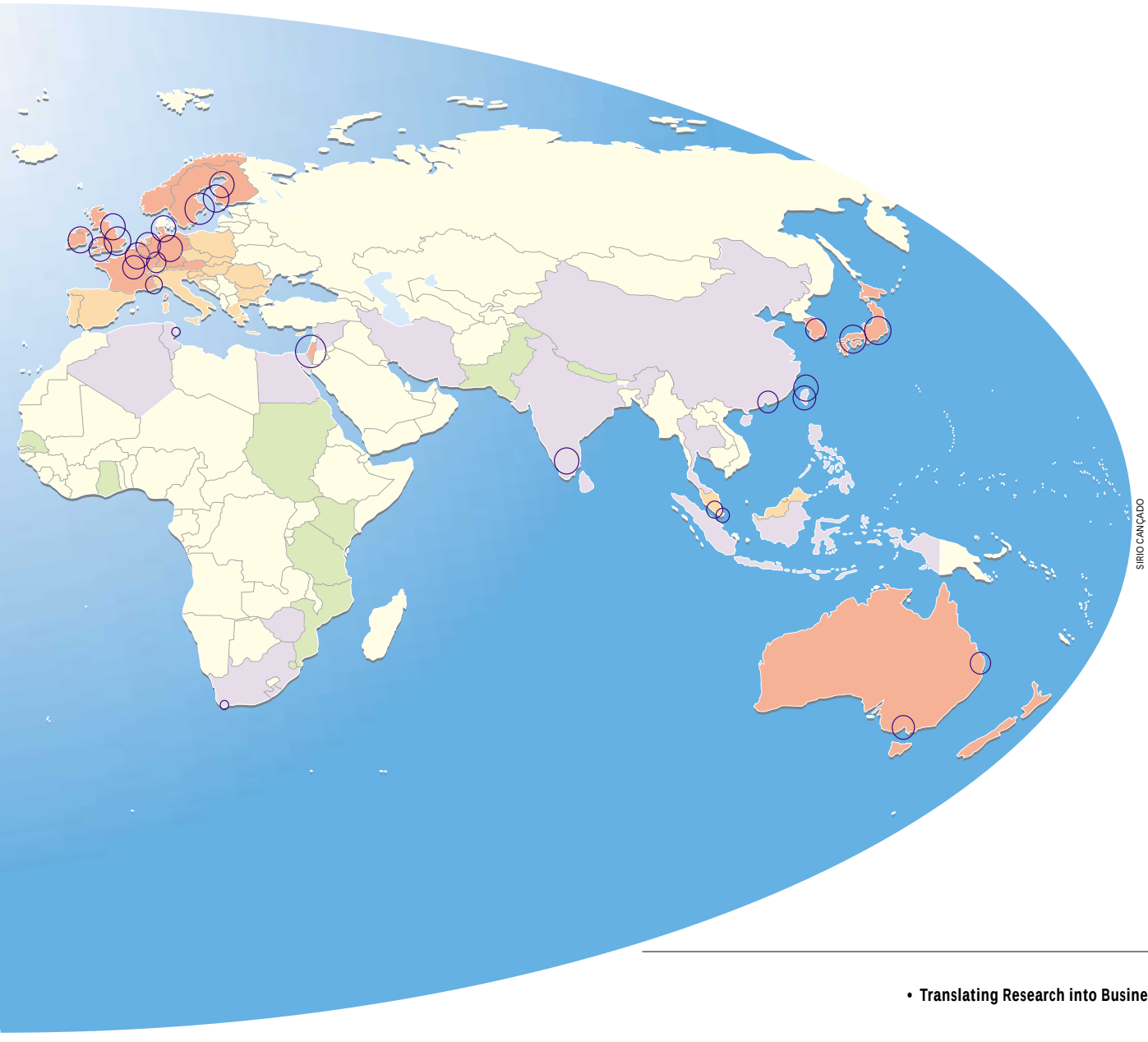
Thus, in 1995, the first of the current twelve programs geared to Technological Innovation began to operate. Conceived in the Scientific Directorate and approved by the Foundation's Governing Body, the Partnership for Technological Innovation Program (PITE) began to accept proposals that year. And, after ten years of activity, it now numbers 90 approved projects and an investment of over R$ 90 million, or US$ 37,5 million – 46 per cent of which contributed by partner businesses. The program is open to researchers from research institutions based in the State of São Paulo in partnership with businesses of whatever size regardless of whether they are headquartered in Brazil. The part of the project financed by FAPESP is developed in the academic research institution.

Brazil: according to the UN, an outstanding region for investment in technology



In addition to promoting partnerships between academic institutions and businesses, FAPESP perceived that there existed in São Paulo a scientific and technological base capable of creating and developing small innovative businesses. Consequently, it set up the Technological Innovation in Small Businesses (PIPE), which supports scientific and technological research projects undertaken in small businesses. Created in 1997, in its first year of activity PIPE received 82 proposals and 32 of them were awarded finance. Today, more than R$ 71 million, or around US$ 29,5 million, have already been invested in the 435 approved projects. Of these, 64 per cent are in the second phase or are actively seeking capital for the commercialization of their results in Brazil or abroad.

PIPE is based on the Small Business Innovation Research program (SBIR), maintained by the National Science Foundation (NSF) in the United States. The projects are developed in three phases, within the small business, they do not require the investment counterpart and they must lead to an innovation with commercial value. In phase 1, the viability of the proposal must be studied. In phase 2, a prototype of the proposed innovation is developed. In phase 3, aimed at the development of products, the Foundation may finance a small business through partnerships such as that made possible by the Support for Research in Businesses Program (Pappe), run by Finep which is an agency of



SIRIO CANÇADO

the Ministry of Science and Technology. Partnership with the Brazilian Support Service for Micro and Small Businesses in São Paulo (Sebrae) is another means of support for the development of business plans.

One of the assumptions is that micro and small businesses are important vectors of technological development, that is to say, they are capable of creating technology which could reach the production line or be licensed by larger businesses. The program also seeks to encourage undergraduate and post-graduate students to set up businesses, with a strategy of incorporating knowledge produced in the academic environment into a product, developing research aimed at innovation.

Expansions

The confirmation that investments of this nature do indeed bring significant socioeconomic returns opened perspectives for the formation of groups of businesses from the same economic sector, in partnership with teaching and research institutions in the State of São Paulo, for the solution of shared technological problems. This perception led FAPESP to offer a third form of university-business cooperation: the Sectoral Consortiums for Technological Innovation or the ConSITec Program.

Jointly responsible for the creation of a considerable number of innovations, FAPESP decided to organize the Program for the Support of Intellectual Property (PAPI), which operates within the ambit of the Nucleus for Patenting and Licensing of Technology (Nuplitec). This program assists the researcher in the protection of intellectual property arising from the results of the project and has already financed 114 patent requests since May 2000.

Programs

The affinity between projects and its vocation to produce original industrial products and processes led FAPESP in 2002, to classify as Technological Innovation some of its programs with that characteristic. Today, in addition to PITE, PIPE, ConSITec and PAPI-Nuplitec, there are a further eight programs: FAPESP-Genome, with 17 projects and subprojects of genetic analysis and sequencing; FAPESP-Biota, to inventory and characterize the biodiversity of the State of São Paulo, with consequent bioprospection for pharmaceuticals; Centers for Research, Innovation and Dissemination (Cepid), which supports ten centers of excellence in scientific and technological research; Information Technology in the Development of Advanced Internet (Tidia), for the study of digital communications networks; Network for Structural Molecular Biology (Smolbnet), to elucidate structures of proteins associated with sequenced genes in the FAPESP-Genome program; Viral Genetic Diversity Network, to study genetic varieties of viruses of importance to public health; Integrated System for Hydrometeorology in the State of São Paulo (Sihesp), which involves studies on the hydric resources in the State of São Paulo; Public Policies, aimed at providing support for public administration; and Technology Parks, to promote the incorporation of science and technology in the entrepreneurial sector.

Science, Technology and Development

FAPESP's most recent program arose out of an initiative of the government of the State of São Paulo to promote and develop Technology Parks. The program centers on the existing competitive base in the State for the production of academic research and the training of human resources, involving the four most important Brazilian poles for the production of technology, located in the capital and in the regions of São Carlos, Campinas, and São

Four great technological poles

The cities of São Paulo, Campinas, São José dos Campos and São Carlos have universities, research centers of international caliber, availability of qualified personnel and high technology businesses

LUIZ GRANZOTTO/PREFEITURA

Campinas

DIVULGAÇÃO/PREFEITURA

São Carlos

EDUARDO CESAR

São Paulo

JARBAS MOURA ROSA PMSJC

São José dos Campos

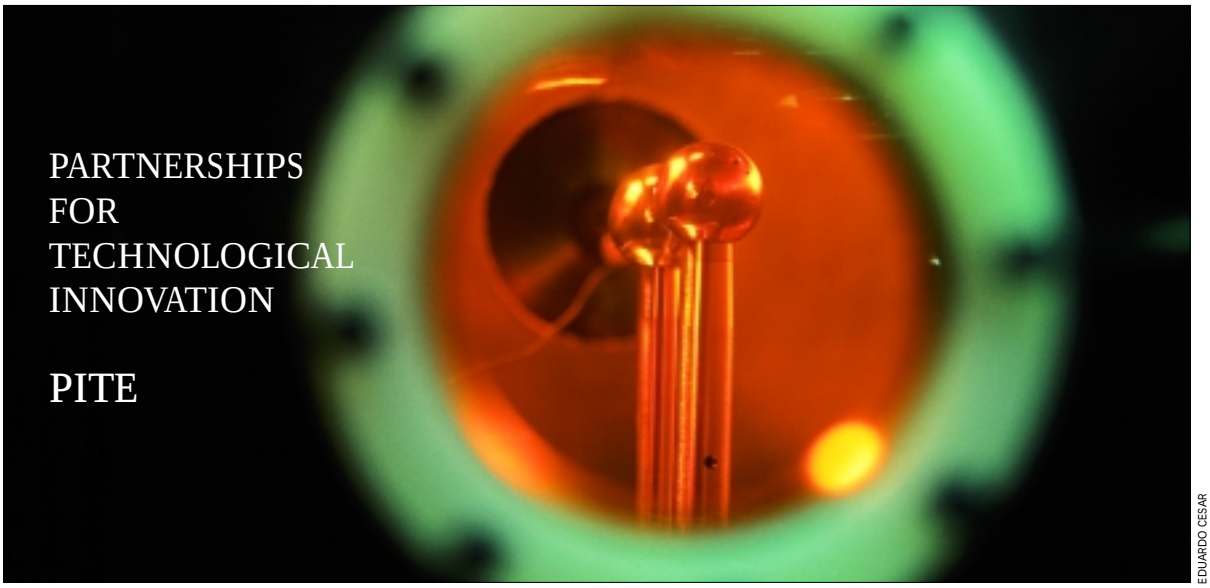
José dos Campos. This is a strategic governmental program for the development of the State of São Paulo, operated by FAPESP through an agreement signed in November 2004 with the Secretariat for Science, Technology and Economic Development (SCTDE). The program brings together and complements initiatives from the local academic institutions for the development of the Technology Parks. SCTDE contributed R$ 2,5 million, more than US$ 1,04 million, for the development of business plans and the study of partnership alternatives with the private sector, and a further R$ 17 million (US$ 7,1 million) has already been designated for investment in infrastructure.

Supervised by independent specialist consultants, this system of Technology Parks is intent on incorporating Research and Development in private enterprise, leading to the development of innovations in businesses, increasing their competitiveness and distributing benefits to society.

The initiative is sowing its seeds in fertile ground, given that a report published by the United Nations in 2001 showed the State of São Paulo to be one of the outstanding regions for investment in technology, in competitive comparison with other world centers. The United Nations Human Development Report for that year, included a ranking of the technological development of 72 countries, classified on the basis of a Technology Achievement Index (TAI). This index evaluates processes of creation, use and dissemination of technologies. Brazil held two of the 46 World Centers of Technological Innovation – one in São Paulo and the other in Campinas. Another document, published in September 2004 by the Economist Intelligence Unit (EIU), an economic analysis unit from the same group that publishes *The Economist* magazine, placed Brazil in sixth place out of countries where businesses from all over the world intend to invest in Research and Development up till 2007.

In which of the following countries is your business planning to invest more in R&D in the next three years (excluding your domestic market)? (The ten most quoted out of 54)	(% of replies)
1. China	39
2. United States	29
3. India	28
4. United Kingdom	24
5. Germany	19
6. Brazil	11
7. Japan	10
8 = France/Italy	9
10. Czech Republic	8

Source: The Economist Intelligence Unit



EDUARDO CESAR

Agrarian Sciences

Biological Sciences

Health Sciences

Exact and Earth Siences

Engineering

EDUARDO CESAR

• The project texts retain the objectives of the proposals as they were originally presented.

1th Bidding Instructions

2th Bidding Instructions

3th Bidding Instructions

4th Bidding Instructions

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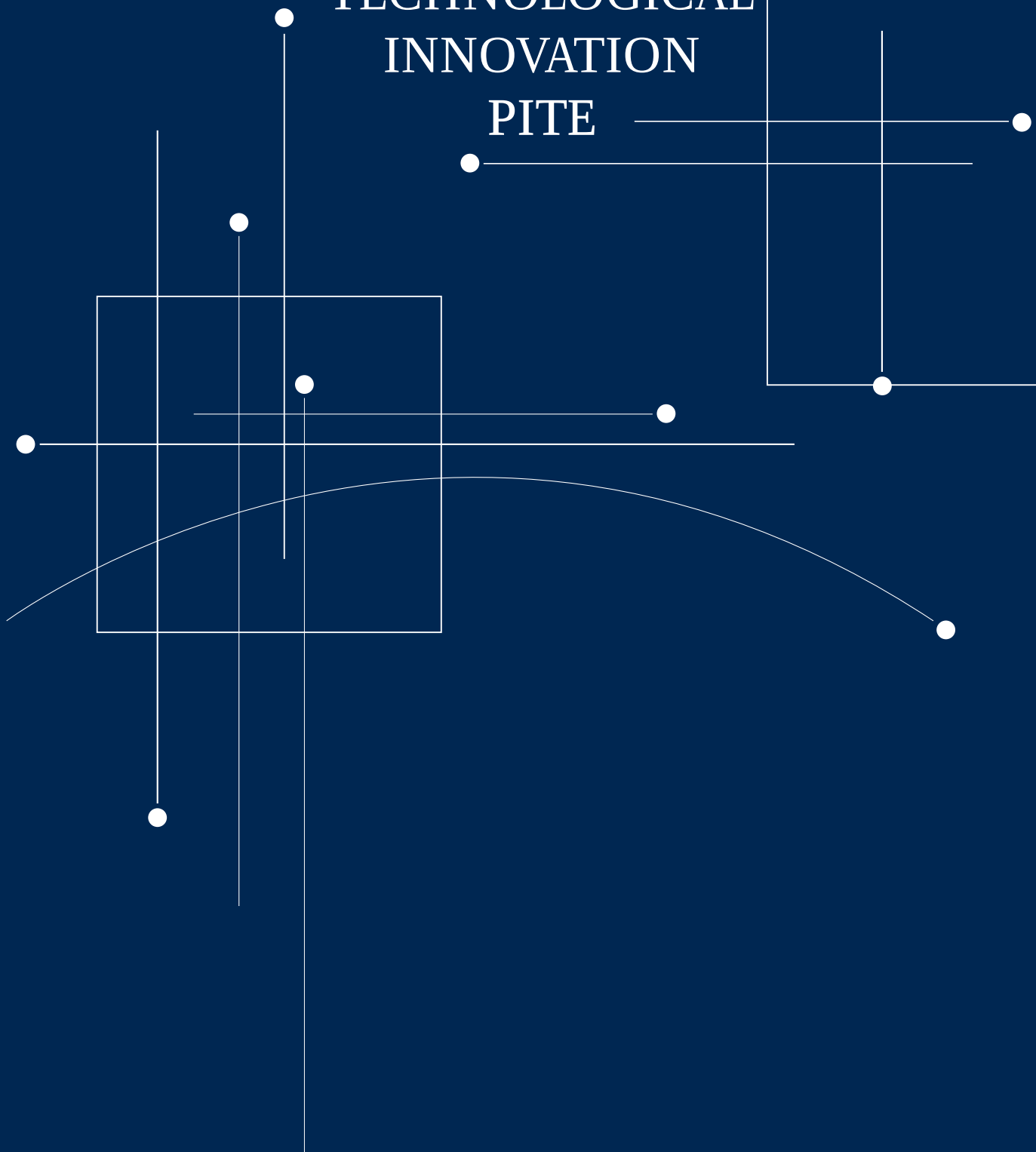
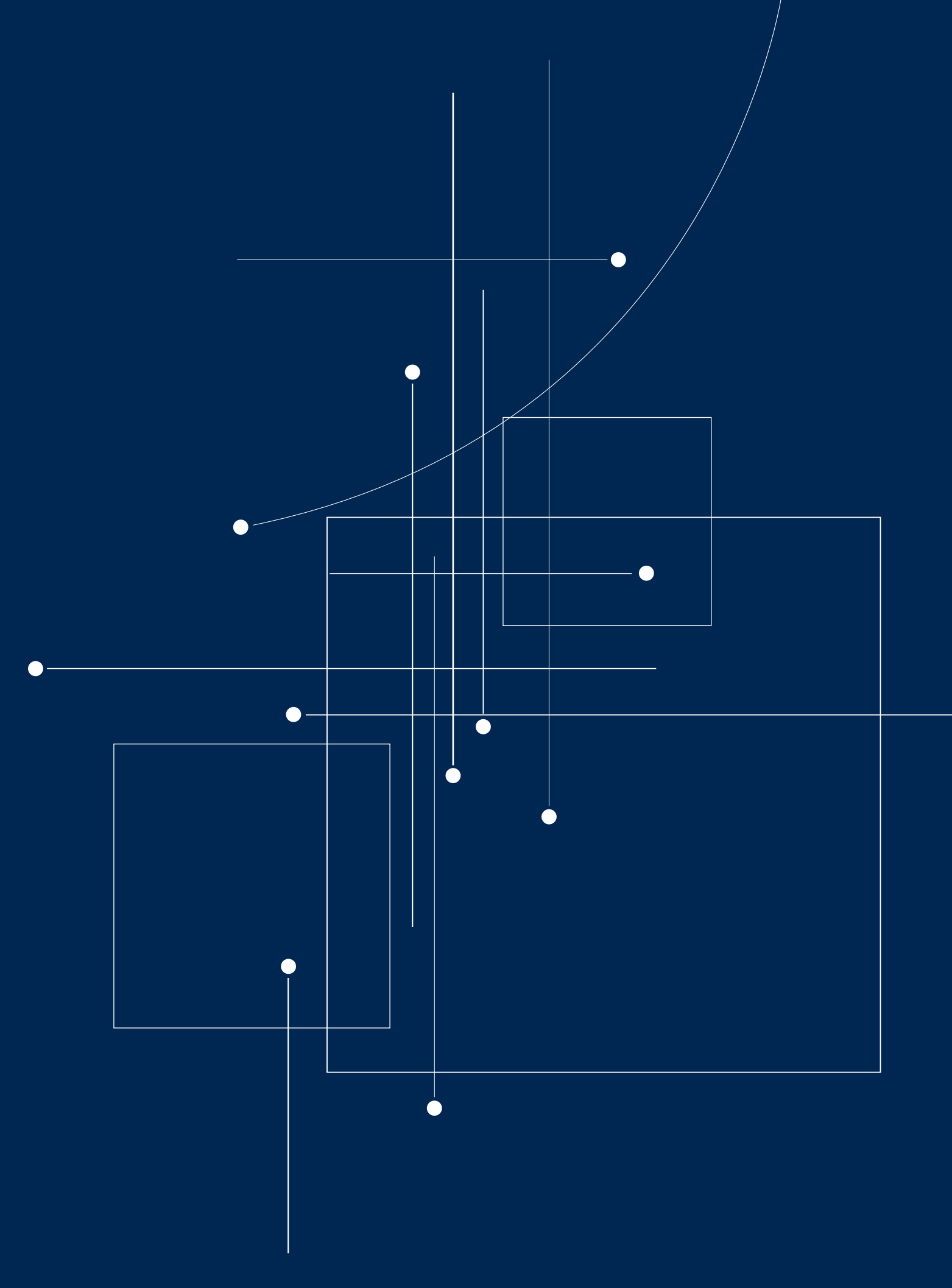
PARTNERSHIPS FOR TECHNOLOGICAL INNOVATION PITE





AGRARIAN SCIENCES

1 Agronomic and Industrial Evaluation of Citrus Varieties

Coordinator:
Luiz Carlos Donadio

Institution:
School of Agrarian and Veterinary Sciences of Jaboticabal / Paulista State University (Unesp)

Company:
Montecitrus Trading S/A

Approved value:
Company: R$ 18,100
FAPESP: R$ 41,800
Sum total: R$ 59,900

Start: 1/8/1996
Finish: 31/7/1999

This research project was aimed at the agronomic and industrial evaluation of new varieties and clones of orange trees, in a partnership between the Citrus Culture Experimental Station of Bebedouro (EECB-SP) and the company Montecitrus Trading. Nine varieties of "precocious" orange trees (those that give fruit in the north of the State of São Paulo from July to August) were evaluated, in partial substitution for those currently used in citrus farming, with the aim of improving productivity and quality of the final product – concentrated orange juice. Eight of them showed characteristics close to or even better than those of the Hamlin, presently the most planted precocious variety. The study of the "mid-season" oranges (July to October) involved close to three dozen varieties, with the Tarocco A and Early Oblong varieties proving to be outstanding. In relation to the "late" varieties (September to January), it was concluded that those currently planted – Valência and Natal – show the best advantages. No less than 150 new varieties of orange trees alone were introduced into the EECB in the period 1997/98, during the research, which established data that will serve as a basis for future plantings. Further studies are looking to evaluate close to 250 other varieties.

2 Development of a Program for the Management of Elodea densa and Egeria densa in the Jupiá Reservoir

Coordinator:
Robinson Antonio Pitelli

Institution:
School of Agrarian and Veterinary Sciences of Jaboticabal/ Paulista State University (Unesp)

Company:
Cesp – Cia. Energética de São Paulo

Approved value:
Company: R$ 154,868
FAPESP: R$ 33,600 / US$ 112,700
Sum total: R$ 188,468 / US$ 112,700

Start: 1/1/1997
Finish: 30/6/1998

The high proliferation of the submerged aquatic macrophyte (higher plant) *E. densa* in the reservoir of the Jupiá Hydroelectric Plant (SP) has caused increasing operational problems for the enterprise. The research aimed to develop techniques that could be used in their control and it developed into three interdependent sub-units. The first corresponded to the identification of the species that occur in the reservoir and to the mapping of their possible ecotypes, using techniques of electrophoresis of isoenzymes and DNA. The second sub-unit corresponded to the work aimed at the development of biological programs for the control of *E. densa*. Fungi were isolated and one of them proved to be capable of controlling the proliferation of *E. densa*. In the third sub-unit, the endeavor was to generate the necessary information for the development of control programs with the use of herbicides. An economic and operational analysis of all the treatments with potential use for the control of *E. densa* was also undertaken.

3 Food and Agriculture Quality in a Market Economy: Organic Production and the Certifying of Farm Products for Obtaining a Green Seal

Coordinator:
Siu Mui Tsai

Institution:
Nuclear Energy in Agriculture Center / University of São Paulo (Cena/USP)

Company:
Shimura's Granja/Shimura Alimentos Ltda.

Approved value:
Company: R$ 74,200
FAPESP: R$ 115,050 / US$ 56,111.11
Sum total: R$ 189,250 / US$ 56,111.11

Start: 1/7/1998
Finish: 30/6/2001

Rural modernization has brought benefits, but at the same time social and environmental problems, such as growing pollution through the intensive use of agrochemicals. This project initially aimed to obtain agricultural commodities (corn and beans) and potatoes through an intensive system of organic production (worm humus), with low use of additives and at a lower cost when compared to conventional agriculture. Cena/USP and the Microtoxin Laboratory of the Luiz de Queiroz Higher School of Agriculture (Esalq)/USP continued in their efforts to achieve a qualification for certifying farm products with the official mark of the Green Seal, by means of a comparative analysis of the organic production of beans, corn and potatoes by the company Shimura Alimentos Ltda. with other conventional production of these crops. This project could also serve as a model to make the Brazilian small farm holder economically viable, via the production of clean and certified foodstuffs. With the qualification of the Cena/Esalq laboratories in toxicological analysis, the opportunity will also be open for interaction between a teaching and research institution with companies which need to have their products qualified.

4 Study of the Technical Viability of Microriveted Cans for the Storage of Edible Vegetable Oil

Coordinator:
Silvia Tondella Dantas

Institution:
Food Technology Institute (Ital)

Company:
CSN – Companhia Siderúrgica Nacional

Approved value:
Company: R$ 35,429.03
FAPESP: R$ 5,079.03 / US$ 28,350
Sum total: R$ 40,508.06 / US$ 28,350

Start: 1/3/1996
Finish: 31/7/1997

Microriveting, the process of sealing cans which allows for a significant reduction in the material used and the use of sheets of low thickness for tops and bottoms of the cans, is an important technological development. However, because of its reduced dimensions in relation to the traditional system used, i.e. conventional riveting, questions arose regarding its mechanical resistance and its capacity to guarantee the integrity of the packaging when exposed to the stages of processing, transportation and distribution of the canned product. The present research project aimed to study the properties and performance of the 900 ml microriveted can, in the preserving of edible oil. With the adequate performance of the microriveted can for oil proven, the market is now offered cheaper packaging with a greater capacity to preserve the product than plastic containers. Microriveting technology was developed by the Kramer Group of Jundiaí (SP).

5 Development of Technology Aimed at the Use of Derivatives of Yeast in Human and Animal Foodstuffs

Coordinator:
Valdemiro Carlos Sgarbieri

Institution:
Food Technology Institute (Ital)

Company:
Cooperativa dos Produtores de Cana, Açúcar e Álcool of the State of São Paulo

Approved value:
Company: R$ 596,730
FAPESP: R$ 62,651 / US$ 18,500
Sum total: R$ 659,381 / US$ 18,500

Start: 1/12/1998
Finish: 31/11/2001

The objective of this project was the use of the biomass of yeast for obtaining modified products and functional ingredients by means of fractioning in order to obtain derivatives with different chemical, nutritional and functional properties. The process followed two schemes: a) the biomass, after being cleaned and mechanically broken up and centrifuged, provided a sediment (cellular wall I) and a clear liquid, which after treatment, resulted in a precipitate (proteic concentrate); b) the biomass, after cleaning, was subjected to a process of autolysis so as to obtain autolysed material. This autolysed material underwent two different treatments: one, dehydration in a spray drier (total dehydration of the autolysed material), while another part was subjected to centrifuging in order to obtain a precipitate (Cellular wall II) and another clear liquid (extract). The extract could be concentrated so as to obtain a concentrated extract, or could be dried in order to obtain a dehydrated extract. The extract, concentrated or dehydrated, is used in the food industry as an ingredient for nutritional and flavor enhancement.

The proteic concentrate is used to improve products such as meats, breads, soups and sauces. The fractions, cellular wall I and II, could be used as a source of soluble fiber and/or thickener/stabilizer for emulsified or jellified foodstuffs.

6 Increase in the Biomass of the Eucalyptus Tree by the Introduction of the CAB Gene via Genetic Modification

Coordinator:
Carlos Alberto Labate

Institution:
Luiz de Queiroz Higher School of Agriculture/University of São Paulo (Esalq/USP)

Company:
Cia. Suzano de Papel e Celulose

Approved value:
Company: R$ 75,127
FAPESP: R$ 49,930 / US$ 163,791.76
Sum total: R$ 125,057 / US$ 163,791.76

Start: 1/7/1998
Finish: 30/6/2001

The objective of this technologically innovative project was the genetic modification of commercial hybrids of *Eucalyptus grandis* and *Eucalyptus smith* with the chimerical pea gene RSLhcb1. To this end, initially different methods of transformation were tested, using *Agrobacterium*, bombardment with microprojectiles and electroporation of protoplasts. The research took as its base the results of the expression of that gene in tobacco plants (*Nicotiana tabacum*) and lettuce (*Lactuca sativa*), which promoted the increase in the biomass of the modified plants, in addition to a series of pleiotropic effects on the morphology, vegetative development and physiology. In conditions of light limitation, transgenic tobacco plants display greater photosynthetic capacity and synthesis of carbohydrates. Eucalyptus is an ideal culture for applications of this technology, due to its rapid growth and its capacity for vegetative propagation. The economic importance of the production of cellulose and wood as a source of energy demands that new technologies be incorporated into vegetal improvement system in order to increase the competitiveness of the Brazilian product on the national and international market.

7 Environmental Coloring as a Reproduction Assistant and Reducer of Cannibalism in Matrinxã

Coordinator:
Gilson Luiz Volpato

Institution:
Botucatu Institute of Biosciences/Unesp

Company:
Fish-Braz Comércio, Importação e Exportação Ltda.

Approved value:
Company total: R$ 7,145
FAPESP total: R$ 1,750
Sum total: R$ 8,895

Start: 1/11/1998
Finish: 30/6/1999

The matrinxã (*Brycon cephalus*) is one of the main species used in national fish farming, but its breeding still poses two fundamental problems: induction of spawning and the high index of cannibalism in the first days after the hatching of the larvae. As in previous studies, we observed that environmental coloring affects the aggression and the growth of this species, the present project was set up to use environmental coloration (green) to improve their production, as a way of improving the induced spawning of this species. Furthermore, it was sought to use environmental coloration (red/blue) to reduce aggression during the initial larvae period, thus reducing cannibalism. The results obtained provided clear answers regarding the use of these environmental colors in the production of fresh water sole. This process could certainly impact on the building of reproduction and incubating tanks, currently developed with colors chosen on the basis of criteria other than the animal's response.

8 Evaluation of the Production Potential of Embryos in vitro of Cows with High Genetic Value and Acquired Infertility

Coordinator:
Joaquim Mansano Garcia

Institution:
Agrarian Sciences and Veterinary School of Jaboticabal/Paulista State University (Unesp)

Company:
Gertec Representação, Assessoria e Produção de Embriões Ltda.

Approved value:
Company: R$ 195,180
FAPESP: R$ 129,700 / US$ 12,351.59
Sum total: R$ R$ 324,880 / US$ 12,351.59

Start: 1/4/1998
Finish: 31/3/2001

Cows with acquired infertility are routinely destined to slaughter, without their genetic potential being totally exploited. Much better use could be made of these animals in programs of *in vitro* fertilization (IVF). In Brazil, there are still no IVF programs aimed at rural producers. For this reason, we proposed a project in conjunction with companies that work in the area of transfer of bovine embryos, for an initial evaluation of the exploitation of the embryos of cows with acquired infertility in *in vitro* production (IVP) and to study the viability of implanting this methodology in the commercial ambit.

9 Food Dispenser for Larvae and Fish Farming of Pacu and Matrinxã

Coordinator:
Gilson Luiz Volpato

Institution:
Botucatu Institute of Biosciences/ Paulista State University (Unesp)

Company:
Fish-Braz Comércio, Importação e Exportação Ltda.

Approved value:
Company: R$ 23,202
FAPESP: R$ 18,000
Sum total: R$ 41,202

Start: 1/3/2000
Finish: 28/2/2001

This project sought to solve an important problem in fish farming: how to distribute the ration in the feeding of larvae adequately. Current methods are precarious, allowing for high mortality rates, high competition for food (which leads to large growth differentials in individual fish), low growth rates and ration waste. The proposal entailed the introduction of a device that would carry out a more adequate dispersion of the ration in the fish breeding tanks. It requires no electricity, being operated manually, with the dispersion taking place by the hydraulic force deriving from the movement itself, nor is experience required for its operation. The project aimed to test the efficiency of this equipment, the prototype of which we had already constructed, on two species of fish: pacu or raw tilapia (*Oreochromis niloticus*) and matrinxã (*Brycon cephalus*). Both are unquestionably of commercial value in the Brazilian fish farming industry. The former species has a gregarious habit, forming shoals. The latter is more aggressive, with a high rate of cannibalism, though these species represent the two main social characteristics among fish. The larvae were introduced into their respective tanks and their size assessed after 30 and 45 days, whilst between the two dates food quantity and feeding time were fixed. At the end of the experiment, the survival rate was assessed.

10 Alteration of the Quality of Eucalyptus Wood

Coordinator:
Carlos Alberto Labate

Institution:
Luiz de Queiroz Higher School of Agriculture/ University of São Paulo (Esalq/USP)

Company:
Cia. Suzano de Papel e Celulose

Approved value:
Company: R$ 770,850.24
FAPESP: R$ 117,691 / US$ 925,350.62
Sum total: R$ 888,541.24 / US$ 925,350.62

Start: 1/7/2002
Finish: 30/6/2005

Biotechnology has been revolutionizing human activity in the most diverse areas. In the forestry sector technologies are being rapidly incorporated such as transgenics based on studies in genomics, proteomics and bioinformatics. The association of biotechnology with conventional programs for the improvement of trees can accelerate the process of development of products with specific characteristics. In the paper and cellulose industry, the sourcing of trees with a reduced content or altered composition of lignin is one of the examples of the application of these technologies. The present project aimed

to modify the quality of eucalyptus wood altering its composition. The proposal was to obtain a product with different chemical properties and physical characteristics, enabling a reduction in the costs of the industrial paper production process.

11 FORESTS: Eucalyptus Genome Sequencing Project Consortium

Coordinator:
Helaine Carrer

Institution:
Luiz de Queiroz Higher School of Agriculture/ University of São Paulo (Esalq/USP)

Company:
Consórcio de Empresas Florestais de Papel e Celulose

Approved value:
Company: R$ 1,005,000
FAPESP: US$ 530,000
Sum total: R$ 1,005,000 / US$ 530,000

Start: 1/11/2001
Finish: 31/10/2003

The Eucalyptus Genome project aimed to identify 15 thousand genes by means of the sequencing of approximately 100 thousand ESTs (Expressed Sequence Tags), prepared from libraries of different tissues, including plantules, leaves, roots, stems and wood. The EST sequences were recorded automatically and clustered for the identification of the genes. By means of the use of bioinformatics, the project carried out an analysis of those sequences, observing redundancy during the sequencing; the (Blast) comparison of the sequences with those deposited in international data bases and in the FAPESP-Genome program; and the clustering of the sequences obtained from special programs for data analysis, such as CAP3 and others. In addition, it was endeavored to use the information obtained to carry out an analysis of the genic expression using the microarrays. In this way, it was sought to develop a new technology for the identification of genes involved in the genetic control of the quality of the wood and in the resistance to disease and pests, environmental stresses and tolerance to nutritional deficiencies. The intention was for this information to be made available rapidly to companies for the modification of the properties of the wood in industrial use or in other applications.

12 Development of Molecular Markers based on ESTs of Sugar Cane for Selection of Economically Important Characteristics

Coordinator:
Anete Pereira de Souza

Institution:
Center for Molecular Biology and Genetic Engineering/State University of Campinas (Unicamp)

Company:
Cooperativa dos Produtores de Cana, Açúcar e Álcool of the State of São Paulo

Approved value:
Company: R$ 103,675.30
FAPESP: R$172,403 / US$ 42,495.22
Sum total: R$ 276,078.30 / US$ 42,495.22

Start: 1/7/2002
Finish: 30/6/2005

The project of sequencing ESTs (Sugarcane EST Project - Sucest) in FAPESP's Genome program has already identified around 40 thousand clusters which represent the genes of sugar cane. ESTs have the potential to be used in the development of genetic markers. In this way, microsatellite markers can be obtained from databases of ESTs, and ESTs probes can be used in RFLP tests for the mapping of QTLs. Bearing in mind the advances that should be achieved in the genetic improvement of sugar cane with the exploitation of the information contained in the ESTs databases, the proposal is, based on these sequences, to develop microsatellite, molecular markers of the RFLP type. It is also intended to develop specific markers for agronomic characteristics of interest, via conversion of RFLP markers (hybridized with ESTs probes) into specific PCR markers (SCARs and STSs). The development of these markers will be integrated into a mapping program of the qualitative and quantitative characteristics that are being developed with the use of an F1 population, obtained from the crossing of two commercial varieties of sugar cane.

13 Identification of Molecular Markers Attached to Genes Resistant to Race 1 of Oidium (Sphaerotheca fuliginea) and to Papaya Ringspot Vírus, Watermelon Strain, in Melon (Cucumis melo)

Coordinator:
Luis Eduardo Aranha Camargo

Institution:
Luiz de Queiroz Higher School of Agriculture/ University of São Paulo (Esalq/USP)

Company:
Sakata Seed Sudamerica Ltda.

Approved value:
Company: R$ 47,800
FAPESP: R$ 118,400
Sum total: R$ 166,200

Start: 1/7/2003
Finish: 31/12/2005

Amongst the methodologies used for the identification of molecular markers linked to genes of interest (in this case, resistance to pathogens), the comparative analysis of almost isogenic strains, which differ from each other merely by the presence or absence of specific genes, is one of the most efficient. Two almost isogenic strains of melon, AF-426 (P1) and AF-2196 (P2), contrasting in the absence and presence, respectively, of alleles of resistance to Oidium and PRSV-W, are compared using Rapo (Random Amplified Polymorphic DNA) and AFLP (Amplified Fragment Length Polymorphism). These strains, in turn, are compared with AF-125 (P3), the donor strain of alleles of resistance. Markers present in the resistant converted strain P2 and in the donor strain P3 and absent in the susceptible recurrent strain P1 are considered potentially linked to the genes of resistance in question. The link between these marker candidates and the genes of resistance is confirmed using a population derived from the retrocrossing (P2 x P1) x P1, which is evaluated for resistance to two pathogens, in different experiments conducted in greenhouse conditions. There being a close link between the marker and the gene(s) of resistance, the ultimate objective will be to sequence the linked markers and transform them into Scar (Sequence Characterized Amplified Region) type markers, aiming for their use in programs of genetic improvement to resistance aided by markers.

14 Sequencing of Bovine Expressed Sequence Tags (Best)

Coordinator:
Luiz Lehmann Coutinho

Institution:
Luiz de Queiroz Higher School of Agriculture/ University of São Paulo (Esalq/USP)

Company:
Central Bela Vista – Angus Bela Vista Pecuária Ltda.

Approved value:
Company: R$ 1,175,000
FAPESP: R$ 730,868
Sum total: R$ 1,901,368

Start: 1/2/2003
Finish: 31/7/2004

The main objective of this project was the identification of bovine genes with a potential for use in the development of new products and technologies to be exploited commercially. In parallel, the information created while the work was in progress was of inestimable value to the scientific community, notably in the areas of zootechnics, biology, genetic and veterinary medicine, among others. For this purpose, approximately 100 thousand expressed sequences (ESTs) were analyzed, obtained from the sequencing of libraries of cDNA, prepared with the messenger RNA extracted from different organs and bodily tissue (such as testicles, skin, muscle tissue and adipose tissue). The production of libraries of cDNA followed the strategy used by the Sucest project (Sugarcane EST Project), in which the fragments of cDNA produced with the SuperScript Plasmid System kit (Gibco-BRL) are selected by size in seraphose column and subsequently cloned in the vectors pSport-1 and 6, which were transferred by cells of *Escherichia coli* (DH10B strain) by the technique of electroporation.

BIOLOGICAL SCIENCES

15 Production of Botulinic Serum, Toxins and Vaccines

Coordinator:
Isaías Raw

Institution:
Butantan Institute

Company:
Solvay Saúde Animal Ltda.

Approved value:
Company total: R$ 25,000 / US$ 150,000
FAPESP total: R$ 25,000 / US$ 110,000
Sum total: R$ 50,000 / US$ 260,000

Start: 1/6/1996
Finish: 31/12/1999

The aim of this project was to develop and set up a unit for the production of botulinic toxins, with a 50 liter fermenter and downstream processing, aimed at: 1) producing botulinic toxins A, B, E of medium grade purity intended for the production of antibotulinic serum for supply to the National Health Foundation and the requirements of other countries. The product would be produced by the institute and commercialized by the Fundação Butantan; 2) producing botulinic anatoxins C and D intended, respectively, to immunize birds (or horses) and cattle, and to be commercialized by the Solvay company; 3) producing botulinic toxins A and B of high quality for clinical and scientific use. These products would be commercialized by the Fundação Butantan.

16 Project: Construction and Operation of a Pilot Plant for the Recovery of Gallium from Bayer Liquor

Coordinator:
Arthur Pinto Chaves

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
CBA – Cia. Brasileira de Alumínio

Approved value:
Company: R$ 313,516.91
FAPESP: R$ 228,936 / US$ 76,892.79
Sum total: R$ 542,452.91 / US$ 76,892.79

Start: 1/7/1997
Finish: 30/6/1999

The project proposed to design, build and operate a pilot factory for the extraction of gallium using Bayer liquor. The technology was developed for the extraction of high purity gallium – a strategic metal in the computer and telecommunications industry of high commercial value – using Bayer liquor, one of the main waste products from the processing of aluminum from bauxite. During the project ionic resins were also developed for the retrieval of gallium from the Bayer liquor and a substance to separate the metal from the resin.

17 In vitro and in vivo Evaluation of Nineteen Molecules with High Anti-inflammatory Potential

Coordinator:
Gilberto de Nucci

Institution:
Institute of Biomedical Sciences/ University of São Paulo (ICB/USP)

Company:
Aché Laboratórios Farmacêuticos S/A

Approved value:
Company: R$ 42,000 / US$ 93,000
FAPESP: R$ 140,000 / US$ 90,000
Sum total: R$ 182,000 / US$ 183,000

Start: 1/12/1998
Finish: 30/11/1999

The project aimed to evaluate *in vitro* and *in vivo* laboratory synthesized molecules, with anti-inflammatory action, leading from there to new medicines. The *in vitro* evaluation was carried out, on the one hand, through the contact of the synthesized molecules with the cyclooxygenase enzyme, present in all inflammatory processes. Tests were carried out on platelets of human blood. The *in vivo* tests were carried out on mice. One of the synthesized molecules displayed positive results in all the *in vitro* and *in vivo* tests.

18 Purification and Description of the Antigens of Pork Tapeworms (Taenia crassiceps) for the Development of Diagnostic Reagents for Human Cysticerosis

Coordinator:
Adelaide José Vaz

Institution:
School of Pharmaceutical Sciences/ University of São Paulo (USP)

Company:
Biolab-Mérieux S/A

Approved value:
Company: R$ 42,000
FAPESP: R$ 33,100 / US$ 8,800
Sum total: R$ 75,100 / US$ 8,800

Start: 1/12/1997
Finish: 29/2/2000

Cysticercosis is a serious problem in the Public Health system in Brazil, caused by the presence of the *Taenia solium* (*Cysticercus cellulosae*) larvae in the human organism. Frequent locations are the skeletal muscle, the ocular system and the central nervous system. The nervous form, neurocysticerosis, is considered to be of the greatest clinical concern. However, a safe diagnosis of neurocysticerosis is difficult due to the large variety of clinical possibilities and inconsistencies of the symptoms presented. Computerized tomography of the cranium and magnetic resonance are currently the techniques that help with the diagnosis. They are, however, very expensive and it is not always possible to reach a conclusive diagnosis. The immunological evaluation in the serum and its correlation with the cephalo-rachidian liquid (CRL) are determining elements in the evolution of the disease. Various techniques have been developed as a diagnostic, both through serum and through LCR, the Elisa test being the method of choice. The difficulty of obtaining antigen extracts from naturally infected pigs and the low specificity of the Elisa tests, mainly in serum, indicate the need to invest in new discoveries. Consequently, the objective of this project was to obtain antigens from an experimental source, as well as the preparation and purification of antigen fractions for use in rapid and low cost testing, which make it possible to detect indicators of this disease in the human organism. The research reached its proposed result, and the product is now in the improvement stage, prior to being produced on a commercial scale.

19 Analysis of the Life Cycle of Packaging for the Brazilian Market

Coordinator:
Luís Fernando Ceribelli Madi

Institution:
Institute of Food Technology (Ital)

Company:
Fundação de Desenvolvimento da Pesquisa Agropecuária (Fundepag)

Approved value:
Company: R$ 280,000 / US$ 45,000
FAPESP: R$ 92,800 / US$ 138,200
Sum total: R$ 372,800 / US$ 183,200

Start: 1/3/1997
Finish: 28/2/1999

This project proposed to carry out a Life Cycle Analysis (LCA) study of approximately twenty packaging systems in the national market. With financial support from FAPESP and from a consortium of associations and companies, it aimed to identify strategic actions for improvements in whatever stage of the processes involved in the production, use and final disposal of the packaging, taking into consideration the minimization of its environmental impact. The work was developed using methodology selected from those available on the international market, in accordance with the Society of Environmental Toxicology and Chemistry (Setac), the Environmental Protection Agency (EPA) and ISO 14000 regulations, and from a proposed database of national processes and products, which will also contain reference information on external markets. The study was applied to packaging systems of some national products, with a significant share of packaging consumption in the country, with emphasis on the comparison of the environmental impact of different packaging alternatives and in the detection of the critical points of the production processes and final disposal of the packaging open to improvement and with consequent potential for optimization, thus contributing to the application of clean technologies aimed at the sustainable development of the country.

20 Control of Contamination by Filamentous Fungi, and Heat Resistant Actinomycetes in Aseptically Processed Tomato Derivatives

Coordinator:
Pilar Rodriguez de Massaguer

Institution:
School of Food Engineering/ State University of Campinas (Unicamp)

Company:
Tetra Pak Ltda.

Approved value:
Company total: R$ 144,022
FAPESP total: R$ 38,745 / US$ 190,627
Sum total: R$ 182,767 / US$ 190,627

Start: 1/3/1997
Finish: 28/2/1999

This project aimed to quantify and identify the flora of mildews and heat resistant actinomycetes in tomato juice and pulp processed aseptically in Tetra Pak packaging and to evaluate the presence of patulin and verrucologen mycotoxins in the final pro-

duct of these derivatives. The characteristics were also determined of the content of residual oxygen, pH and permeability of the packaging that might contribute to the development of these microorganisms. The study made it possible to establish the sources of contamination and, after the identification and selective screening of the most resistant organisms, the thermal resistance of these mildews was evaluated and compared to the resistance of bacterial targets normally used to establish the thermal process of acidic foodstuffs (*CI. pasteurianum* and *B. coagulans*), using as a substrate the derived tomato products produced by processing factories. The level of sterilization required by the product was established and the re-dimensioned thermal process (retention time, temperature) was tested. The processes, once the methodologies of control and quantification were validated, were passed on to the participating industries.

21 Development of a New Class of Anti-Hypertensive

Coordinator:
Gilberto de Nucci

Institution:
Institute of Biomedical Sciences/ University of São Paulo (ICB/USP)

Company:
Laboratórios Biosintética Ltda.

Approved value:
Company: R$ 400,000
FAPESP: US$ 474,823.02
Sum total: R$ 400,000 / US$ 474,823.02

Start: 1/11/2000
Finish: 30/06/2005

The aim of this project is to develop a new class of medicines for the treatment of cardiovascular diseases. This new class of medicines are the aspirinates. Basically, this involves attaching a molecule of anti-hypertensive substances (for example atenolol and carvedilol) and a calcium antagonist (nimodipine) to an aspirin molecule, given that aspirin offers a significant therapeutic effect when administered daily in low doses. The immediate advantage would be that the patient, by taking just one pill, would be ingesting a substance in vivo which would release two important main agents in the treatment of his disease.

22 Krahô Project: Study of Medicinal Plants

Coordinator:
Elisaldo Luiz de Araújo Carlini

Institution:
Paulista School of Medicine/Federal University of São Paulo (EPM/Unifesp)

Company:
Biolab Sanus Farmacêutica Ltda./ Eurofarma Labs. Ltda / VYTY-CATI (Krahô)

Approved value:
Company: R$ 238,468
FAPESP: R$ 347,550/ US$ 337,900
Sum total: R$ 586,018/ US$ 337,900

Start: 1/7/2003
Finish: 30/6/2005

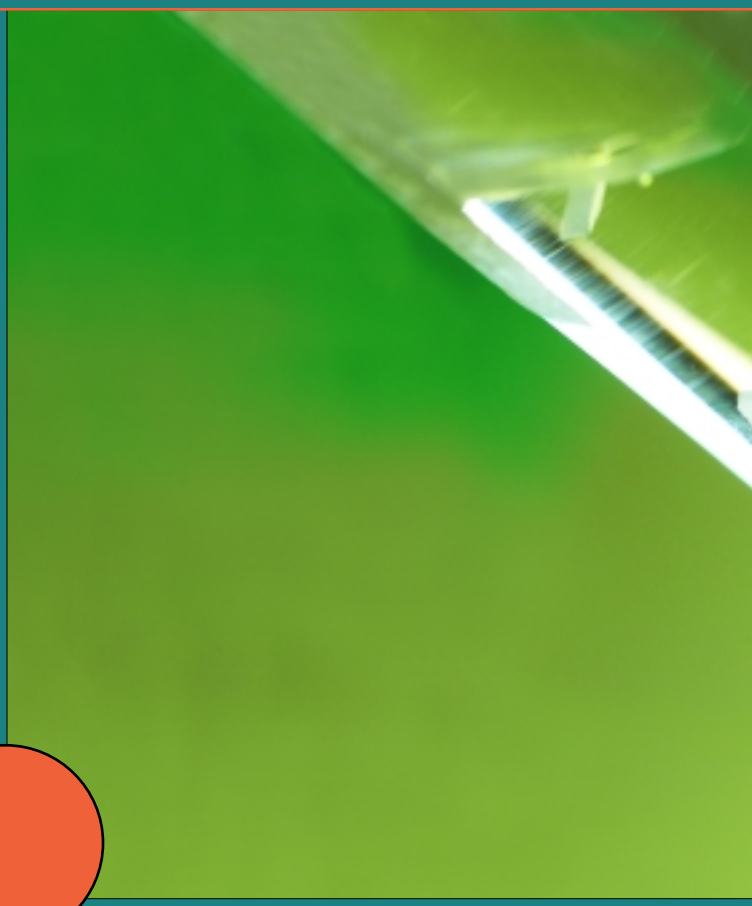
The present proposal entailed the continuation of the previous project, which focused on an ethnopharmacological survey amongst the Krahô Indian ethnic group. In this study, data was obtained on the use of 138 plant species in 292 recipes prescribed for 51 therapeutic indications, which probably have something to do with the central nervous system. Given this wealth of data, it was sought to begin the first pharmacological and phytochemical tests that would enable the investigation of these botanical extracts on laboratory animals in order to discover new phytotherapics. The studies should extend over the next ten years and will follow a span of collaboration between eminently national institutions: the Federal University of São Paulo (Unifesp), Biolab/Sanus Farmacêutica, Eurofarma Laboratórios and the VYTY-CATI Association, which represents the Krahô ethnic group. In addition to this, the project will receive consultancy from other groups of researchers from the country's universities. In the case of a phytotherapic resulting from this work, a patent will be sought by the institutions mentioned.

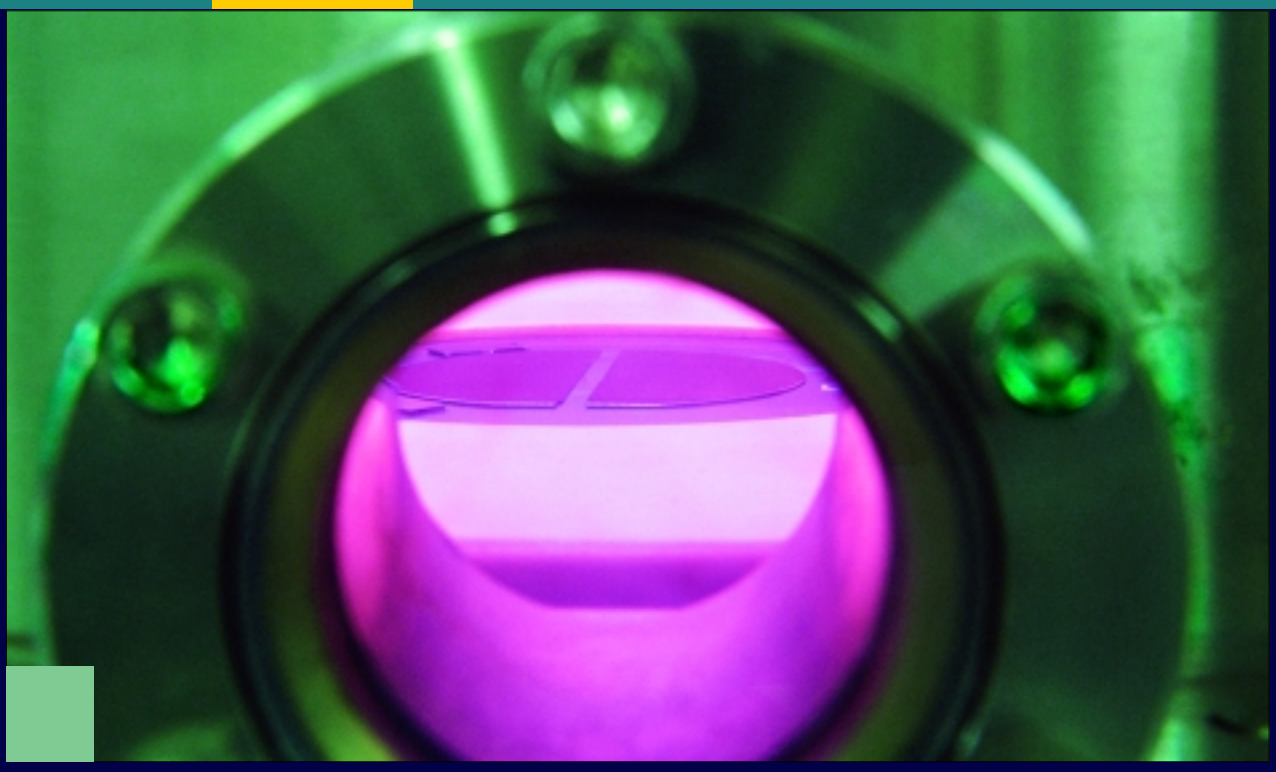
23 Adaptation for Veterinary Use of the Type Rabies Antigen in Adhered BHK Cells Used for Humans

Coordinator:
Hisako Gondo Higashi

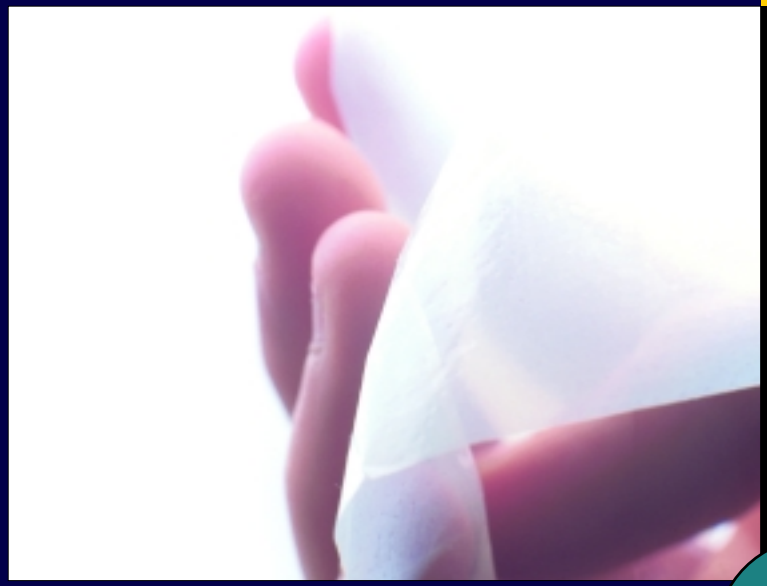
Institution:
Butantan Institute

MIGUEL BOYAYAN





EDUARDO CESAR



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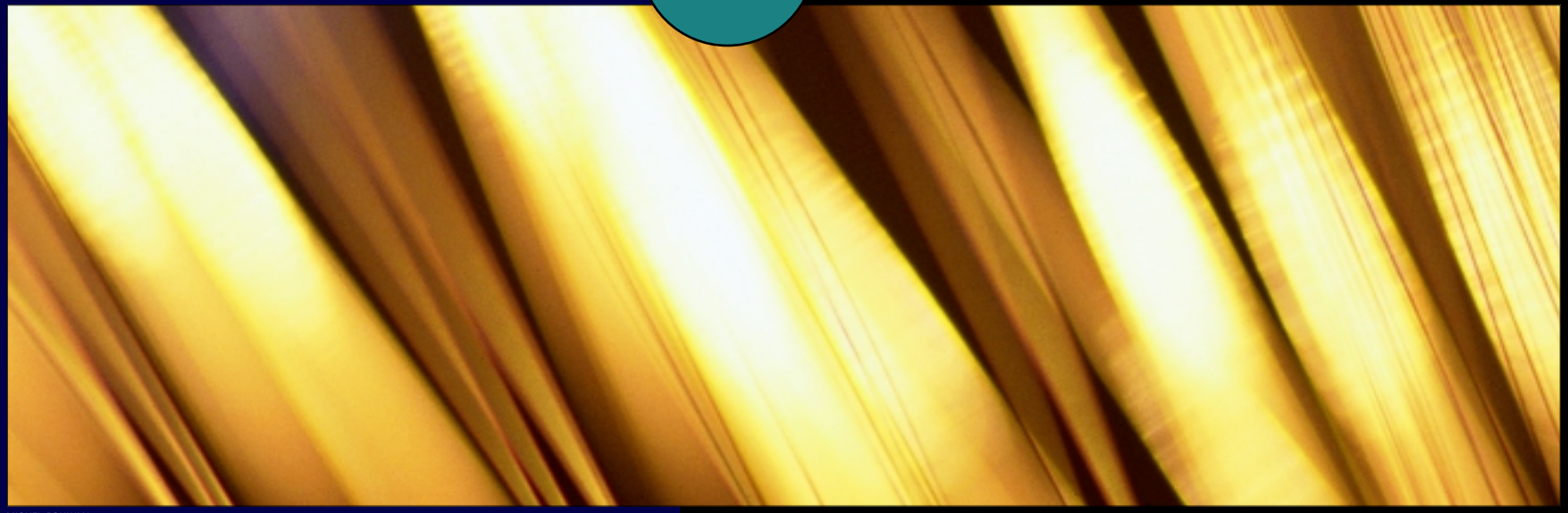

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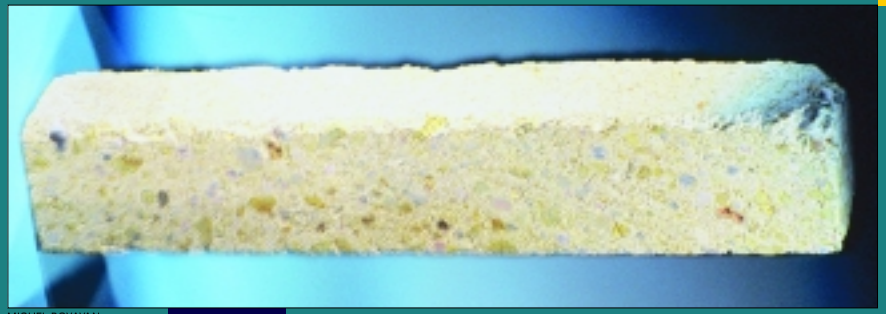

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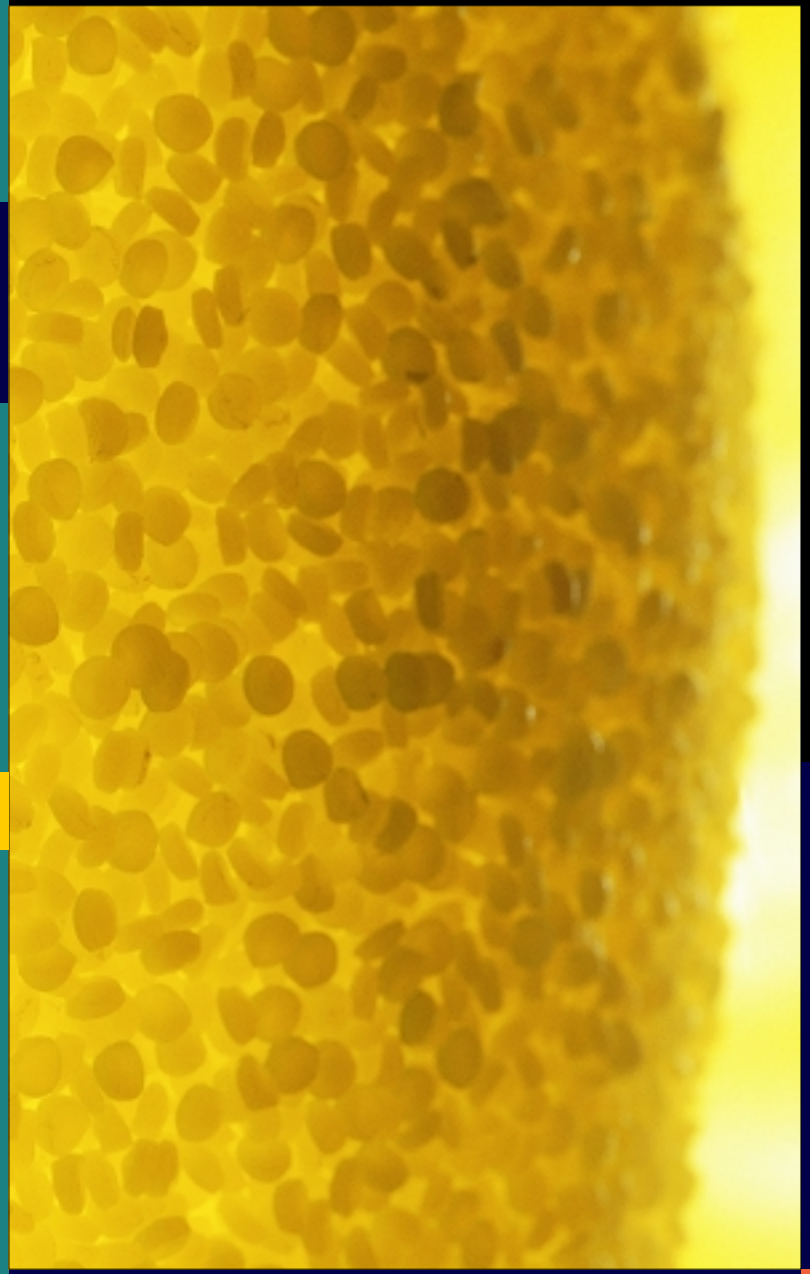


EDUARDO CESAR

MIGUEL BOYAYAN

EDUARDO CESAR

MIGUEL BOYAYAN

Company:
Produtos Veterinários Ouro Fino Ltda.

Approved value:
Company: R$ 196,675.46
FAPESP: R$ 196,675.46
Sum total: R$ 393,350.92

Start: 1/11/2004
Finish: 31/1/2006

The production and manufacture of vaccines against rabies for veterinary use using technology already developed for human use, of the type rabies antigen in adhered BHK cells, is aimed at increasing global productivity in response to new market demands. This involves a relevant technological innovation for the country, insofar as it will create the conditions for a significant increase in competitiveness in the biological products segment of the Brazilian veterinary market, tending to provoke a substantial drop in the price of these vaccines for the end consumer. This innovation will have a positive impact on public health, in addition to producing savings for the Ministry of Health, which is responsible for the vaccination of 19 million dogs in the entire country. The two institutions involved in this project are committed to the proof of concept of production and they should undertake every effort to achieve ideal levels of quality and efficiency of manufacture on an industrial scale and tests of the product in the field to comply with the necessary steps for the transference of this technology.

24 Development of Vaccine Against Group A Beta Hemolytic Streptococcus

Coordinator:
Luiza Guilherme Guglielmi

Institution:
Heart Institute (Incor), University of São Paulo (USP)/ State of São Paulo Health Secretariat

Company:
Laboratório Teuto Brasileiro Ltda.

Approved value:
Company: R$ 2,704,840
FAPESP: R$ 239,663 / US$ 1,402,960.95
Sum total: R$ 2,944,503 / US$ 1,402,960.95

Start: 1/4/2002
Finish: 31/3/2005

The principal aim of the present project was the development of a vaccine for the prevention of rheumatic fever and other infections caused by type A beta hemolytic *streptococcus*, in partnership with totally national private enterprise. Considering also the high socioeconomic costs of these pathologies, there is as a final goal the production of an effective subunit vaccine, that will offer protection against infections from the various serotypes of beta hemolytic streptococcus of the group. The vaccine should be, at the same time, safe and incapable of setting off chronic inflammatory or autoimmune reactions, such as observed in rheumatic fever. It will use as immunogene, sequences conserved from aminoacids of the C-terminal region of the M protein. Provided we keep our sights on the reliability and safety of the vaccine, its use may be guaranteed in the prevention of streptococcic infections with possibilities for applications also in developed countries.

25 Microencapsulation of Human Pancreatic Islands and Tissue Engineering as Alternative Treatment for Diabetes Mellitus

Coordinator:
Mari Cleide Sogayar

Institution:
Chemistry Institute/University of São Paulo (IQ/USP)

Company:
Biobrás S/A

Approved value:
Company: R$ 207,952
FAPESP: R$ 138,200 / US$ 239,378
Sum total: R$ 346,152 / US$ 239,378

Start: 1/2/2000
Finish: 31/1/2004

The isolation, purification and microencapsulation of pancreatic islands constitute a promising alternative in the treatment of diabetes *mellitus* (DM). This project aimed: 1) to optimize and perfect the isolation, purification and cryopreservation of human pancreatic islands derived from organs taken from donor cadavers; 2) to reconstitute the microenvironment by means of the co-cultivation of isolated islands with cells of the pancreatic tissue, in the absence and presence of the extracellular matrix, so as to maximize its survival and functionality; 3) to microencapsulate the isolated islands using previously

designed biocompatible materials and/or new materials resulting from tissue engineering; and 4) to analyze the functional activity of the microencapsulated islands both *in vitro* and *in vivo*. The development of this project should permit the creation of products (biomaterials for the production of microcapsules) and processes (technology for the microencapsulation of pancreatic islands), opening up, thus, a new and revolutionary treatment perspective for diabetic patients.

26 Transcriptome of Sugar Cane

Coordinator:
Glaucia Mendes Souza

Institution:
Chemistry Institute/University of São Paulo (IQ/USP)

Company:
Cooperativa dos Produtores de Cana, Açúcar e Álcool of the State of São Paulo e Central de Álcool Lucélia Ltda.

Approved value:
Company: R$ 823,563
FAPESP: R$ 493,543 / US$ 82,255
Sum total: R$ 1,316,106 / US$ 82,255

Start: 1/8/2003
Finish: 31/7/2005

The production of sugar and alcohol in Brazil would greatly benefit from the introduction of varieties with a higher content of saccharose and greater resistance to biotic and abiotic stresses. The establishment of such varieties, using traditional techniques of genetic improvement, is slow. The process could be accelerated if the target genes for the improvement were identified. The recent sequencing of 237 thousand sugar cane ESTs (Expressed Sequence Tags) offers the opportunity to study its levels of expression on a large scale, using the technology of microarrays of cDNA. The analysis of the transcriptome of contrasting varieties of high and low sugar content using DNA chips, could indicate genes involved in the induction of the accumulation of saccharose throughout the maturation of the plant, pointing the way to the genetic manipulation of this gramineum. In addition to this, a global analysis of the transcriptome of this plant subjected to insect attacks, to interactions with endophytic bacteria, to hydric stress, among other factors, would be extremely valuable for the improvement program. This project aims to use the technology of microarrays of cDNA for the analysis of 6,528 transcripts in contrasting varieties of cane for the accumulation of sugar and subjected to the previously mentioned conditions. The project also envisages the making up of nylon membranes containing 3 thousand clones, which will be made available to researchers interested in analyzing the response of this plant to other phenomena.

27 Development of System for Control of Ant Colonies in Urban Environments

Coordinator:
Odair Correa Bueno

Institution:
Institute of Biosciences of the Paulista State University (Unesp – Rio Claro)

Company:
Vitex – Agricultura e Pecuária Ltda.

Approved value:
Company: R$ 84,600
FAPESP: R$ 114,800
Sum total: R$ 199,400

Start: 1/4/2003
Finish: 30/3/2006

Considering that ants are social insects with a very well established division of labor amongst its members, the functional unit is the colony as a whole and not an ant in isolation. This project proposes the development of a system involving the use of attractive baits in order to carry out control of colonies of the species that have the status of pest. Although the use of baits has a long history in the control of pests, there is today renewed interest in their application, something which is due to several factors. Amongst them, pressure from public opinion for a reduction in the use of insecticides, the requirement for a correct evaluation of the ideal insecticide to be used and the increase in the safety of the applicators and the users. The proposal for the development of an efficient system for the control of ant colonies based on knowledge acquired in basic research involves two paths: to act on research aimed at providing assistance to technological development and to provide a basis for the legalization of the final product.

HEALTH SCIENCES

28 Development of a Transference Mold – Zanetti Technique

Coordinator:
Artêmio Luiz Zanetti

Institution:
Bauru School of Dentistry/ University of São Paulo (USP)

Company:
Teccom Industrial e Comercial de Equipamentos Ltda.

Approved value:
Company: R$ 96,250
FAPESP: R$ 194,000
Sum total: R$ 290,250

Start: 1/3/1998
Finish: 28/2/2001

The aim was to develop a new method for simplifying and giving greater precision in the mounting of models of the upper dental arch, in semi or totally adjustable articulations. The project presented a new technique in molding, obtaining, transference and mounting of the plaster model in the articulating device, in any case that demands the use of an articulator for the diagnosis and planning of patient treatment. The project had as its final objective the development of a so-called transference mold, with which one is able to transfer the measurements of the upper arch of the patient to the articulator in a single stage, without the need to elaborate bases of measurement and orientation plans, and without the use of the facial arc fork and two halves of the transference of the model. During the execution of the project, at the stainless steel phase, prototypes were developed due to the complexity of the various anthropometric standards that exist within the country.

29 Development of Optimized Implants for the Areas of Low Bone Density and Products for Bone Regeneration

Coordinator:
Aguinaldo Campos Junior

Institution:
Bauru School of Dentistry/ University of São Paulo (USP)

Company:
Kunzel Brasil Equipamentos Odontológicos Ltda.

Approved value:
Company: R$ 582,000
FAPESP: R$ 307,637 / US$ 158,160.20
Sum total: R$ 889,637 / US$ 158,160.20

Start: 1/9/1998
Finish: 31/8/2001

The aim of the present project was to promote the development of products aimed at the huge market of Brazilians with missing teeth and/or localized bone loss. The second generation of this product should replace, with advantages, previously available products. Its goal was the fast production of a variation of the system of implants with innovative characteristics and the production of substances for bone regeneration – reabsorbable membrane and inorganic bovine bone –, as well as amelogenin, a product with cemental regeneration capacity, and bone morphogenetic protein (BMPs).

EXACT AND EARTH SCIENCES

30 Implementation of a Telemedicine and Medical Practice Support Network Covering the Whole Brazilian Territory

Coordinator:
Álvaro Garcia Neto

Institution:
São Carlos Institute of Physics/ University of São Paulo (USP)

Company:
Unimed – Participações S/C Ltda.

Approved value:
Company: R$ 333,072
FAPESP: R$ 168,722.54 / US$ 40,407.46
Sum total: R$ 501,794.54 / US$ 40,407.46

Start: 1/3/1996
Finish: 28/2/1998

The use of computer networks is one of the modern-day revolutions. With this in mind, Unimed approached the universities for guidance as to how

to make best use of them. In September 1993, an agreement was signed between the São Carlos Institute of Physics and Chemistry of the University of São Paulo, via the Foundation for the Support of Physics and Chemistry, and Unimed Participações. This agreement resulted in Brazil's first network to use the TCP/IP protocol via satellite (VSAT), which has 43 points of presence, spread throughout the Brazilian territory. These points constitute the network backbone. The objective of this second project was to expand this backbone to the 250-plus remaining points (Unimed affiliates), to form UniRed, in order to provide telemedicine services (access to information, new techniques, continuous training, publication of periodicals, bibliographical research) and medical practice support services (virtual doctors on duty distributed by area of medical specialty and electronic mail).

31 Development of Remote Management System for Quality Control Programs in Imaging Diagnosis Departments

Coordinator:
Jean Albert Bodinaud

Institution:
Institute of Electrotechnics and Energy/ University of São Paulo (USP)

Company:
Unidade Radiológica Paulista Clínica de Diagnóstico por Imagens

Approved value:
Company: R$ 39,500 / US$ 12,600
FAPESP: R$ 20,852 / US$ 131,186.54
Sum total: R$ 60,352 / US$ 143,786.54

Start: 1/3/1998
Finish: 28/2/2001

The objective of quality assurance in imaging diagnosis is to optimize the quantity of clinically useful information in the radiological images, while reducing doses of radiation and minimizing operational costs. This project aimed to develop a computer communications network, over which part of the data used in this kind of assessment would be sent, several times a day, via Internet, to a center for the reception, storage and analysis of data, located in the Institute of Electro-techniques and Energy (IEE-USP). In addition, the network would have a system for sending performance reports in real time to the management of the clinics, allowing corrective action to be taken quickly. In order to do this, specific hardware and software were configured, and equipment was developed, dedicated to the constant assessment of the control parameters of the film processors, and another for the assessment, in the field, of the geometrical characteristics of the focal points of X-ray tubes, based on a CCD camera. All the performance tests of the equipment carried out periodically were automated, with the use of suitable instrumentation, controlled by portable microcomputers.

32 Project and Implementation of an Automatic Grammar Reviser for the Portuguese Language

Coordinator:
Maria das Graças Volpe Nunes

Institution:
São Carlos Institute of Mathematical Sciences /University of São Paulo (USP)

Company:
Itautec-Philco S/A

Approved value:
Company: R$ 78,000
FAPESP: R$ 17,954 / US$ 9,200
Sum total: R$ 95,954 / US$ 9,200

Start: 1/10/1997
Finish: 30/9/1998

The research aimed to carry out studies in computational linguistics for the production of a new version of Itautec-Philco S/A's Grammatical Reviser, which is now on the market. The original version, which included automatic syntactic analysis and corrected several kinds of errors, was perfected, following the creation of rules to avoid lexical ambiguities and ambiguities in syntactical structures. In order to do this, studies were undertaken of the written Portuguese language in a *corpus* (a body of texts) of over 35 million words. Besides serving for the creation of the rules, the study of the *corpus* made it possible to extend the process of identifying the errors frequently committed by users of secondary school level, making the Grammatical Reviser suitable for its target public, namely secretaries and office workers in general. In this new version, the Grammatical Reviser works coupled with an online grammar, which supplies contextualized grammatical assistance, based on the difficulties identified in the correction of the text by the user himself. The implementation of the online grammar was an im-

portant part of the project. The work was carried out with the support of a multidisciplinary team of linguists, and computing professionals who were already working in collaboration.

33 Pilot Training System: Aircraft Cabin Simulator

Coordinator:
Alexandre Carlos Brandão Ramos

Institution:
Technological Aeronautics Institute/ Aerospace Technical Center (ITA/CTA)

Company:
Laboratório de Informática Aplicada (LIA)

Approved value:
Company: R$ 106,000
FAPESP: R$ 97,980
Sum total: R$ 203,980

Start: 1/4/1999
Finish: 31/3/2001

There are at the moment two quite different kinds of simulator for aircraft pilots: 1) the flight simulator properly speaking, an extremely expensive piece of equipment, which accurately represents all the movements made by the aircraft, and 2) the computer simulator, with software similar to computer games and a low cost, where the pilot verifies the aircraft's behavior without having the real three-dimensional impression of piloting the plane. The aircraft cockpit simulator that was the object of this project comes somewhere between these two extremes, as it is a low-cost piece of equipment, comprising a three-dimensional representation of an aircraft cockpit and software that simulates the instruments and main systems. In this kind of simulator, there is no cabin or joystick while piloting the airplane, and the pilot only simulates the operation of some of the systems. A system is already used for pilot training, that combines two important stages in one system: 1) the ground school, where the pilot learns to recognize the physical location of the instruments, the different subdivisions of the control panel, and the check list sequences, and 2) CPT, where the pilot learns the various operating procedures in normal, abnormal and emergency situations. Currently, researchers from the Laboratory of Applied Information Technology – LIA, together with teachers from the Technological Institute of Aeronautics/ITA, are conducting research into a) the area of "intelligent tutor systems", applied to the training of operators in the petrochemical industries and aircraft pilots; and b) "hybrid intelligent systems", for supporting operation and control, and real time systems, both in the petrochemical and in the aeronautical industries; and c) the development of dynamic sites for the Internet, for Ministry of Science and Technology (amongst others).

34 Application of Plasma Torches in Steel-making Processes

Coordinator:
Aruy Marotta

Institution:
Gleb Wataghin Physics Institute / State University of Campinas (Unicamp)

Company:
Villares Metals S/A

Approved value:
Company: R$ 371,403
FAPESP: R$ 310,500 / US$ 305,000
Sum total: R$ 681,903 / US$ 305,000

Start: 1/9/1999
Finish: 31/8/2002

This project set out to develop plasma torch heating technology for the 3-ton steel distributor of the continuous casting system at Villares Metals S/A. It is a known fact that the stability of the temperature of the steel brought about by the plasma torch in the distributor, coupled with an inert atmosphere on the surface of the liquid metal, has a beneficial effect on the quality of the steel, with less segregation and a more homogeneous structure of equiaxial grains. Experience in other countries has shown that the system of plasma in the distributor may offset, within a range of +/-1°C, fluctuations in temperature between one trip and another of the crucible of up to +/-20°C. The most appropriate settings of the torch and the distributor were studied, the level of potency of the torch required to keep the temperature of the steel within desired limits for a given mass of liquid metal, and the effect of the plasma assessed on the quality of the steel and the savings in the process.

35 Development of High Power Lasers with Emission in the Spectral Region of 800 to 1000 nm, Based on Hetero Structures of GaAs/InGaAsP/InGaP

Coordinator:
Wilson de Carvalho Junior

Institution:
Center for Research and Development in Telecommunications and Brazilian Association for Synchrotron Light Agreement/Convênio CPqD-ABTLuS

Company:
AsGa Microeletrônica S/A

Approved value:
Company: R$ 105,900
FAPESP: R$ 49,500 / US$ 124,180
Sum total: R$ 155,400 / US$ 124,180

Start: 1/3/1999
Finish: 28/2/2001

This project sought to develop the manufacture of an encapsulated prototype of a powerful laser with emission in 808 nm, based on heterostructures of GaAs/InGaAsP/InGaP. The performance characteristics of the device were adapted to the applications for use in medical equipment and in Nd:YAG laser pumping. It was also sought to make viable the manufacture of lasers with emissions in 880 and 980 nm, aiming at applications in the pumping of solid state lasers and telecommunications. The performance characteristics envisaged were: 2 W of power in continuous mode (cw) with operating current of 3-5 A, spectral width around 2 nm and beam divergence in the range of 40º and 10º in directions perpendicular and parallel to the active region, respectively. The project involved the collaboration of the laboratory of the Optoeletrônica do Convênio Fundação CPqD/ABTLuS, based in Campinas (SP), with AsGa Microeletrônica, a business located in Paulínia (SP).

36 High Performance Solver for Structured Optimization Problems

Coordinator:
Julio Michael Stern

Institution:
Institute of Mathematics and Statistics / University of São Paulo (IME/USP)

Company:
UniSoma Matemática para Produtividade S/A

Approved value:
Company: R$ 188,000
FAPESP: R$ 96,000
Sum total: R$ 284,000

Start: 1/10/1996
Finish: 31/1/1999

The present research project had the objective of developing Mathematical Programming solvers especially adapted for the optimization of RBAF – Row Block Angular Form and NRBAF – Nested Row Block Angular Form. The project adapted and implemented the structural method developed by the researcher responsible for it as part of his thesis for a doctorate at Cornell University. This method is presented in the article "J.M. Stern and S.A. Vavasis, Active Set Methods for Problems in Column Block Angular Form, Com.Appl.Math", v. 12, p. 199-226, 1994. The solvers were to replace commercial solvers (OSL-IBM) in the MultiFor and DyFor computer programs (software) in UniSoma. This software with an industrial application solves optimization problems of multiple mixtures, with an RBAF structure, and multiperiod optimization problems, with an NRBAF structure.

37 New Inorganic and Hybrid Phosphate-based Pigments

Coordinator:
Fernando Galembeck

Institution:
Chemistry Institute/State University of Campinas (IQ/Unicamp)

Company:
Serrana de Mineração Ltda.

Approved value:
Company: R$ 67,340
FAPESP: R$ 25,915.30 / US$ 107,132.70
Sum total: R$ 93,255.30 / US$ 107,132.70

Start: 1/3/1996
Finish: 31/8/1997

The objective of this project was the development of two new classes of pigment and of the respective manufacturing processes. This involves white pigments and colored pigments, both based on phosphates (condensed or not) of metal ions: aluminum, calcium, iron and others. These new pigments are intended, on the one hand, to replace titanium dioxide in white paints and, on the other, to fill other gaps in the availability of colored pigments, of high optical quality and enhanced chemical stability in the environment. Due to their chemical nature, all the products in question should be exempt from problems of toxicity. Their production and disposal will be effected without creating new environmental problems and without increasing existing problems. Processes were used which have been the subject of patent requests,

lodged by the requesting group; production operations on a pilot scale have been carried out at the premises of the interested company since June 1995.

38 Continuous Production of Fuel Alcohol Using Saccharomyces cerevisiae Supported by Chrysotile

Coordinator:
Inês Joekes

Institution:
Chemistry Institute/State University of Campinas (IQ/Unicamp)

Company:
Sama – Mineração de Amianto Ltda.

Approved value:
Company: R$ 287,610
FAPESP: R$ 71,527 / US$ 62,464.61
Sum total: R$ 359,137 / US$ 62,464.61

Start: 1/1/1999
Finish: 31/12/2000

This technological innovation project refers to the obtaining of fuel alcohol by a continuous process based on sugar cane, using *Saccharomyces cerevisiae* supported by chrysotile, with a view to its industrial implementation to replace the traditional process, whether in batches or semi-continuous. The industrial implementation of a continuous process has long been a target pursued by the productive sector, since it means a reduction in installation and operating costs, and makes it possible to automate the line, thereby allowing a reduction in the price of the ethanol produced. This price reduction is fundamental for making ethanol competitive with gasoline. The heart of the continuous process for this industrial sector is the existence of a chemically, mechanically and biologically stable supported catalyzer. We achieved a catalyzer supported by *Saccharomyces cerevisiae* on chrysotile, in which the cells bind, are not removed, and acquire heat tolerance and display activity for up to one year after their preparation. Bench tests of fermentation with fixed bed reactors, using selected strains, showed efficiency and productivity considerably superior to the best values obtained with free cells operating in a continuous system for up to one month. Fixed beds are not, however, the most suitable in project engineering. There still has to be an increase in scale to confirm whether the increases in efficiency and productivity are maintained.

39 ReGra Project: New Challenges for Automatic Grammar Revision

Coordinator:
Maria das Graças Volpe Nunes

Institution:
São Carlos Institute of Mathematical Sciences/ University of São Paulo (USP)

Company:
Itautec Philco S/A

Approved value:
Company: R$ 214,620
FAPESP: R$ 67,500
Sum total: R$ 282,120

Start: 1/3/2001
Finish: 28/2/2003

ReGra is a grammatical reviser for Brazilian Portuguese that is regarded as the most wide-ranging and efficient of its category on the market. Microsoft acquired a license from Itautec-Philco, the co-sponsor of the project, and today makes ReGra available through its Office 2000 package, ensuring worldwide distribution. The ReGra Project was honored with two prizes, the Pawn of Technology, awarded by the São Carlos High Technology Park Foundation, in 1998, and the Alcatel National Prize for Technological Innovation, in 1999. This very positive scenario may give the impression that the quality of grammatical revision by ReGra had now reached satisfactory levels, and that the development, properly speaking, of the reviser had been concluded. However, tests showed that ReGra's current performance still fell considerably short of what was desirable, with a significant number of omissions (39.48 per cent of all the incorrect sentences were not corrected) and of unwanted actions by the tool (there were 1.03 incorrect actions for each correct action). Therefore there still existed ample margin for work on improvements, which resulted in a far greater evolution than had actually been observed. This evolution demanded efforts to improve the current reviser, but – more importantly – it called for a change of paradigm, both in the use of linguistic strategies and in computer implementation, in particular because the performance of the current version had practically reached its peak in the approach adopted up to this moment. It proved to be indispensable for the strategies used in ReGra to be revised, and for new modules to be added to the existing ones for the revision of texts, in order to expand the number of correct actions of the tool, and, consequently, to reduce the number of its omissions and over-corrections.

40 Development of a Differential GPS System for Positioning and Guidance of Aircraft in Real Time

Coordinator:
Helio Koiti Kuga

Institution:
National Institute for Space Research (Inpe)

Company:
Embraer – Empresa Brasileira de Aeronáutica S/A

Approved value:
Company: R$ 583,586
FAPESP: R$ 67,935 / US$ 218,117
Sum total: R$ 651,521 / US$ 218,117

Start: 1/3/2002
Finish: 31/8/2003

This project was aimed at the application of new precise methods of trajectography and guidance in real time to increase the productivity of landing and take-off attempts and aircraft noise. The work involved the development of: 1) a Differential Global Positioning System (DGPS) which makes it possible to determine on board, with precision and in real time, the position of the aircraft in a system of coordinates; 2) a guidance system which offers the pilot, in real time, information which permits the overflight of previously defined points under desired conditions, within the precisions required by certification; and 3) a complete and integrated project covering the means necessary for the implementation of the Differential Global Positioning System (antennae, RF, telemetry, real time processing, processors, communications boards and interfaces) aimed at reuse in various aircraft and bases.

41 Application of Advanced Computational Fluid Dynamics for High Performance Aircraft

Coordinator:
João Luiz Filgueiras de Azevedo

Institution:
Technological Aeronautics Institute/ Aerospace Technical Center (ITA/CTA)

Company:
Embraer – Empresa Brasileira de Aeronáutica S/A

Approved value:
Company: R$ 3,572,800 / US$ 105,000
FAPESP: R$ 1,665,000 / US$ 1,150,000
Sum total: R$ 5,237,800 / US$ 1,255,000

Start: 1/1/2002
Finish: 31/12/2004

The aim of this project was the integration of innovative technologies for high performance aircraft by means of the creation of a nucleus for the mechanics of Computational Fluid Dynamics (CFD). The development of this project was to enable Embraer to acquire expertise in the area of CFD, enabling it to function in a similar manner to its competitors and to obtain productivity gains and technological innovation. At the present time, the market offers high performance computers with a competitive cost-benefit relationship. At the same time, the current maturity of advanced methods of CFD permits its incorporation in technological application. These factors, together with the high level of expertise in Brazilian research, could allow the convergence and the incorporation of latest generation knowledge, techniques and methods for the application of CFD in the development of high performance aircraft. The making available of state-of-the-art computational resources, currently non existent in the country, should also permit the continued development in the research and teaching institutions and promote the consolidation of parallel computing techniques, with positive impacts on scientific productivity in the area of the mechanics of computational fluids.

42 Identification of Derivatives of Stability and Control Of Aircraft via Non-Linear Filtering and Stochastic Optimization: Algorithms and Data Application from Test Flights

Coordinator:
Luiz Carlos Sandoval Góes

Institution:
Technological Aeronautics Institute/ Aerospace Technical Center (ITA/CTA)

Company:
Embraer – Empresa Brasileira de Aeronáutica S/A

Approved value:
Company: R$ 908,237.50
FAPESP: R$ 121,995 / US$ 195,525.05
Sum total: R$ 1,030,232.50 / US$ 195,525.05

Start: 1/1/2002
Finish: 30/6/2003

This project permitted the complete dynamic modeling, that is to say, the determination of the dynamic parameters and of the aerodynamic derivatives and of the control of aircraft on the basis of test flights. Embraer currently uses static techniques for the determination of these parameters, which does not permit the identification of complete models and requires the use of theoretical data, of tunnel trials, and even exhaustive manual adjustment by trial and error. With the mastery of the modern techniques of dynamic systems identification, the company will be able to make use of more representative data from the aircraft, which will save time and allow it to reduce the cycle of development, notably with respect to control systems, such as automatic pilot, yaw damper and other systems for increasing stability. This project was aimed at the application of new numerical, algorithmic methods and experimental techniques for test flights to increase the productivity and reliability of the dynamic and aerodynamic modeling trials for fixed wing jet aircraft.

ENGINEERING

43 Program for the Development and Construction of Mechanical Heart Valves and from Bovine Pericardium

Coordinator:
Gilberto Goissis

Institution:
São Carlos Institute of Chemistry/ University of São Paulo (IQ/USP)

Company:
Braile Biomédica Indústria, Comércio e Representações Ltda.

Approved value:
Company: R$ 84,624 / US$ 4,545
FAPESP: R$ 33,636 / US$ 47,564
Sum total: R$ 118,260 / US$ 52,109

Start: 1/1/1997
Finish: 31/12/1998

Heart valves are vulnerable to pathologies of several etiologies that severely jeopardize the cardiovascular system. Solutions for these complications generally include valve replacements using mechanical or biological prostheses. Developments in this area have been directed towards improved performance and durability of both kinds of prosthesis (they are suitable for specific situations). In the case of mechanical prostheses, there are no domestic manufacturers nor does the necessary technology exist in Brazil: the development of this technology was one of the targets of this project. In the case of bioprostheses, the objective of this work was to develop new techniques for reticulating the bovine pericardium. The expectation was to achieve more homogenous materials, resulting in significant improvements in the mechanical and biological properties. For mechanical valves, the main objective was to try to meet the repressed market demand, which is associated with the scientific and technological challenge of making a structure in titanium alloys, covered with carbonous materials, widely used in orthopedic prostheses, in association with a covering of hemocompatible materials, in particular collagen.

44 Optical Fiber Catheter for the Diagnosis of Atheromatosis Platelets in the Cardiovascular System

Coordinator:
Renato Amaro Zangaro

Institution:
Institute of Exact Sciences and Technology/ University of Vale do Paraíba (Univap)

Company:
Tecnobio Ltda.

Approved value:
Company: R$ 150,000
FAPESP: R$ 30,800 / US$ 98,982.03
Sum total: R$ 180,000 / US$ 98,982.03

Start: 1/8/1998
Finish: 31/7/2000

Techniques based on Raman spectroscopy and fluorescence spectroscopy, also known as “optical biopsy”, have proven themselves to be potential substitutes for conventional histology. This entails a form of spectral analysis followed by a processing via software which enables the identification of the nature of deposits occurring on the coronary walls. Access to different regions of the body by laser radiation and the collection of the generated signal next to the tissue have proved to be one of the great technological obstacles to this technique becoming definitively established. In the present case, namely, in the diagnosis of *in vivo* coronary pathologies, anomalies are looked for in the wall of the arteries. This

proposal was based on the study of the different parameters that involve a fiber optic catheter, in order to design and build one with a lateral view which, via laser radiation, enables it to stimulate an internal coronary wall, and to pick up in an efficient manner the Raman scattering generated by this same tissue. This catheter should be part of a piece of equipment that enables a diagnosis, in the first instance, and, in a second stage, the destruction of the platelets formed, avoiding perforation of the arteries.

45 Development of Technology for Two- and Three- Dimensional Aerodynamic Trials for High Performance Aircraft Project

Coordinator:
Olympio Achilles de Faria Mello

Institution:
Technological Aeronautics Institute/ Aerospace Technical Center (ITA/CTA)

Company:
Embraer - Empresa Brasileira de Aeronáutica S/A

Approved value:
Company: R$ 3,704,000
FAPESP: R$ 1,894,300 / US$ 948,479.42
Sum total: R$ 5,598,300 / US$ 948,479.42

Start: 1/6/2001
Finish: 31/5/2004

This project is aimed at the application of new methods to increase the productivity and reliability of low velocity aerodynamic tests carried out in Brazil, as well as new methods for two-dimensional and three-dimensional tests, in order to provide the corresponding support to our aeronautical industry, so that it can develop new aerodynamic profiles and wing configurations, and obtain performance gains – and, consequently, an increase in competitiveness – on a time scale compatible with market realities. The innovation proposed here was of an incremental type, so as to fine tune, by means of a series of actions, the services of subsonic aerodynamic tests necessary for the design of aircraft.

46 Panels of Cement from Clinker Reinforced with Fiber Glass E (E-GRC)

Coordinator:
Vahan Agopyan

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Owens Corning Fiberglas A S. Ltda.

Approved value:
Company: R$ 414,962.62
FAPESP: R$ 13,900 / US$ 196,651.60
Sum total: R$ 428,862.62 / US$ 196,651.60

Start: 1/11/1996
Finish: 31/10/1999

The various stages of this research project covered a diagnosis of the market and of the technology for the production of fiber glass components, a diagnosis of alternative applications for steel mill clinker, the development of cement from clinker, a study of the cost and the choice of the cement, the durability of the composites and the development of the panels, as well as the dissemination and transfer of technology. The project succeeded in developing a new kind of low alkaline cement, in which clinker is the basic component, which also contains activators and E-type fiberglass. Panels were obtained with an application in the construction of walls, ceilings, floors and partitions. The project is at the stage of passing on the technology to industry, for commercial scale production. The project opens up the possibility of alternative markets for blast furnace clinker and the use of E-type glass fiber.

47 Development of Technology for the Manufacture of Fibro-cement Tiles without Asbestos

Coordinator:
Holmer Savastano Junior

Institution:
School of Zootechnics and Food Engineering/ University of São Paulo (USP)

Company:
Permatex Ltda. e Imbralit Ltda.

Approved value:
Company: R$ 1,576,560
FAPESP: R$ 213,749 / US$ 95,496.33
Sum total: R$: 1,790,309 / US$ 95,496.33

Start: 1/8/2001
Finish: 31/7/2003

The main objective of this research was to develop a new technology for the production of cement tiles reinforced with cellulose and plastic fibers, for the production of tiles by the modified Hatschek process. The international trend in the civil engineering and building market is for competition based on new technology for composites. On the other hand, the Brazilian building industry, in its residential, industrial and farming sectors, is showing a robust demand for low cost systems, with a rational use of labor and reduction of waste. Also to be observed is the worldwide tendency for the use in the building industry of materials reinforced with fibers, as they offer the possibility to produce slim components, in addition to enhanced energy absorption when struck by sharp forces. Cellulosic fibers are a renewable raw material that has been accepted internationally for over 20 years, in countries such as Australia and the United States. In developing countries too, natural fibers have aroused interest, as reinforcement for fragile cement-based matrixes, due to their low cost, their availability in wood and also fibrous plants, due to the possibility of using fibers considered sub-products of other applications (rope-making, textile industry, paper industry), due to energy savings, and also to environmental issues. With adaptations, these fibers are suitable for production on Hatschek equipment. The principal stages of this study comprised the formulation of the fibrous composite, through the selection and preparation of the fibers and the cement matrix; advice on the adaptation of a Hatschek-type industrial production line, in each partner company; the determination of the mechanical, physical, chemical and microstructural properties of the new material; and the verification of the acceptable performance of the materials and of their durability.

48 Development of Corrugated Cardboard Packaging Systems for Fruit and Vegetables

Coordinator:
Luís Fernando Ceribelli Madi

Institution:
Institute of Food Technology (Ital)

Company:
Associação Brasileira do Papelão Ondulado – ABPO

Approved value:
Company: R$ 41,040
FAPESP: US$ 52,520
Sum total: R$ 41,040 / US$ 52,520

Start: 1/4/1998
Finish: 30/9/1999

The Brazilian fruit and vegetable market, in addition to being highly competitive and risky, displays a high index of product loss (in the order of 12.3 million tons). Therefore, it is essential not only to produce fruit and vegetables of high quality, but also to adopt correct techniques of handling, packaging and transport, so that the products reach the consumer in the best possible state of conservation and so that a reduction is achieved in the index of loss. Thus, it is indispensable to use packaging systems suitable for each type of product. The objective of this project was to develop packaging systems appropriate for seven types of fruit and vegetable products and suitable for our distribution and transport system. Corrugated cardboard combines several characteristics as a packaging material for market gardeners and was to be used in the project. In addition to the packaging, the project also sought to develop seven technical manuals, one for each product, presenting the systems developed.

49 Automated System for Security Copies and the Recovery of Backup/Restore Files on Heterogeneous Platforms

Coordinator:
Antonio Marcos Aguirra Massola

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Perrotti Informática Com., Imp. e Exp. Ltda.

Approved value:
Company: R$ 275,000
FAPESP: R$ 54,700
Sum total: R$ 329,700

Start: 1/3/1996
Finish: 31/5/1997

The objective of this project was to develop an automated system for file backup and restoration on heterogeneous platforms. The research resulted in the development of the EBS - Enterprise Backup System – a piece of backup software to be deployed mainly in corporate environments and which operate over a network of totally interconnected computers of various sizes.

50 System for the Visual and/or Sound Location of Fixed or Moving Objects

Coordinator:
Wilhelmus Adrianus Maria Van Noije

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Microline – Multiplexadores de R.F. Ltda.

Approved value:
Company: R$ 37,500 / US$ 1,000
FAPESP: R$ 55,900 / US$ 5,000
Sum total: R$ 93,400 / US$ 6,000

Start: 1/10/1997
Finish: 30/9/1998

The objective of this research project was to develop a system which would enable objects to be located remotely, whether they were fixed or in motion. Generally speaking, the objects are located by means of a signaling device associated with them which, when activated, enables the identification and location of a specific object contained within a certain perimeter.

51 Development of Integrated Optimization of the Units of an Oil Refinery

Coordinator:
Claudio Augusto Oller do Nascimento

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Petrobras – Petróleo Brasileiro S/A

Approved value:
Company: R$ 573,522
FAPESP: R$ 22,000 / US$ 167,951
Sum total: R$ 595,522 / US$ 167,951

Start: 1/7/1997
Finish: 30/6/2000

Petrobras has ten oil refineries which process the equivalent of several billions of dollars per year. Improvements in the strategies for the control and planning of the operation of these refineries could result in benefits of tens of millions of dollars. This project, therefore, was aimed at the optimization of the operation of the company's refineries, focusing on the three main aspects of the control structure: the actions to maintain the process close to ideal conditions, restrictions over safety, quality, etc., and the level of optimization, at which are defined the optimum conditions for the operation of the equipment and processes which constitute an oil refinery – including the function of production planning. As a product of this work, it was intended to offer to Petrobras, for application in its refineries, a suite of software programs that would be able to interact in real time with all levels in the control of production, from planning up to predictive control.

52 Optimization and Advanced Control of the Cyclohexanol Reactor at Rhodia's Chemical Plant in Paulinia

Coordinator:
Rubens Maciel Filho

Institution:
School of Chemical Engineering/ State University of Campinas (Unicamp)

Company:
Rhodia S/A

Approved value:
Company: R$ 340,600
FAPESP: R$ 25,800 / US$ 20,000
Sum total: R$ 366,400 / US$ 20,000

Start: 1/8/1996
Finish: 31/7/1998

The cyclohexanol reactor is an important piece of equipment for several chemical routines at the Paulinia Chemical Plant (SP), as cyclohexanol is an intermediate item for a great number of products of commercial interest. This is a catalytic process based on the hydrogenation of phenol, in a multistage reactor. In this context, this project aimed: 1) to develop and validate a deterministic mathematical model for the cyclohexanol reactor; 2) to develop a methodology and a procedure for obtaining operational policies for the Paulinia Chemical Plant cyclohexanol reactor, through the use of non-linear deterministic optimization techniques and factorial planning; 3) to develop control structures and algorithms and implement them in the cyclohexanol reactor. Two algorithms based on the concepts of DMC (Dynamic Matrix Control) and STR (Self-Tuning Regulator) were assessed,

initially by simulation, and, subsequently, implemented in real time in the reactor.

53 Prumo – Project of Mobile Units for Technological Assistance for Micro and Small Businesses (MSBs)

Coordinator:
Vicente Nelson Giovanni Mazzarella

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – São Paulo (Sebrae–SP)

Approved value:
Company: R$ 1,182,000
FAPESP: R$ 94,847 / US$ 253,992
Sum total: R$ 1,276,847 / US$ 253,992

Start: 1/5/1998
Finish: 30/4/2000

With organized and programmed action to support micro and small businesses (MSBs) on their own premises, the plan was – with the use of batteries of tests, analyses, on-the-spot control experiments and examinations – to detect faults in raw materials, equipment and processes, and to indicate the necessary modifications, implementing them, whenever possible, expeditiously, as a didactic tool with as much visibility and effectiveness as possible. These dynamics for support should result in innovations, both in processes and in the formulation of the components of the raw materials and in the properties of the end products. These activities will be delivered via Prumo, which consists of mobile laboratory units (MU), operated by specialized engineers and technicians. The in loco technological assistance is expected to last between one and three days. During this period, a survey will also be carried out to identify problems that are common to the sector and afterwards themes for cooperative research, with several MSBs taking part, will be proposed. Management problems may be attended to at a later stage, possibly by Sebrae or other qualified institutions. To start with, this proposal will be applied to the plastics transformation sector.

54 Development of a Polymerization Process for the Production of Polymers with Low Residual Monomer Content

Coordinator:
Reinaldo Giudice

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Rhodia Brasil Ltda.

Approved value:
Company: R$ 135,000
FAPESP: R$ 55,000 / US$ 259,000
Sum total: R$ 190,000 / US$ 259,000

Start: 1/1/1999
Finish: 31/12/2000

The objective of this research was to develop polymerization processes in which the end product had a reduced content of free monomer, without sacrificing the productivity of the process. The innovation consisted of acting on the polymerization process through the use of new initiators and additives, as well as of strategies for adding raw materials during the process and of temperature variations. This made it possible to reduce the process periods associated with the extraction of the residual monomer and to diminish the losses of monomer in this separation. The objective was to meet and to surpass international standards relating to permitted levels of volatile compounds in the product. The technology in use then was based on the extraction by steam, which affects productivity with an additional stage, and creates effluents that have to be treated.

55 Development of Electric Steels

Coordinator:
Fernando José Gomes Landgraf

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
CSN – Companhia Siderúrgica Nacional

Approved value:
Company: R$ 74,500 / US$ 80,000
FAPESP: R$ 88,474.53 / US$ 43,793.73
Sum total: R$ 162,974.53 / US$ 123,793.73

Start: 1/3/1996
Finish: 28/2/1997

The innovations expected from this project were aimed at establishing the technology for the manufacture of two new kinds of steels for electromagnetic purposes, combining the experience of researchers from CSN – Companhia Siderúrgica Nacional and of the IPT – Institute of Technological Research. The characteristics of the two groups that were the objective of this project – Type of steel: high loss; Stage: certification; Losses (W/kg) 1.5 t/60 Hz/0.5 mm: 7.5; Permeability (B50(t)): 1.78. Type of steel: medium loss; Stage: exploratory; Losses (W/kg) 1.5 t/60 Hz/0.5 mm: 5.8; Permeability (B50(t)): 1.74. The project provided for the experimental investigation of the effect of some variables in the processing on the magnetic properties of the steel sheets, with the aim of attaining the above mentioned values of electrical losses and magnetic permeability. Steel with better magnetic properties leads to electric motors that perform better. Support from FAPESP made it possible to construct a system of magnetic measurements and to add new competencies to the teams from the IPT (a new methodology of magnetic testing, the "separation of losses"), widening the range of services that the institute can offer and giving the team deeper insight into the relations between processing, microstructure and magnetic properties.

56 Production of Compounds Based on Natural Fibers for Use in the Automobile Industry

Coordinator:
Alcides Lopes Leão

Institution:
Botucatu School of Agricultural Sciences / Paulista State University (Unesp)

Company:
Toro Indústria e Comércio Ltda.

Approved value:
Company: R$ 728,350
FAPESP: R$ 145,750
Sum total: R$ 874,100

Start: 1/3/1997
Finish: 28/2/1999

The objective of the present project was the development of better technology for converting lignocellulosics (residue or otherwise) and virgin or recycled thermoplastics into environmentally friendly products. The main technologies studied were: the formation of a mantel by deposition by air (non-woven) and mixture by melting (extrusion and injection of mixtures). The steps of the project consisted of developing methods to convert lignocellulosic residue (newspapers, sugar cane bagasse and sawdust) mixed with thermoplastics (polypropylene, polyethylene and polystyrene); optimizing laboratory methods for producing composites for the automobile industry, using residue; setting up a database for various natural fibers (jute, sisal, ramie, coconut, curauá [a kind of fibrous bromeliad], pineapple, linen, sugar cane bagasse, etc.) in different proportions and formulations, aimed at better adhesion and mechanical and physical properties; establishing the extent of the recycling processes of these composites and quantifying the losses of properties, and analyzing their life cycle, in particular with regard to the automobile industry. The composites were assessed for their mechanical properties (flexion, tension), impact (IZOD) and physical properties (swelling and accelerated aging).

57 Development of the Production of High Speed Steel Rolls for Hot Strip Rolling

Coordinator:
Amilton Sinatora

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Aços Villares S/A

Approved value:
Company: R$ 467,700
FAPESP: R$ 145,475 / US$ 30,850
Sum total: R$ 613,175 / US$ 30,850

Start: 1/12/1997
Finish: 30/11/1999

The objective was the production of cast high-speed steel rolls for hot strip rolling, with a performance superior to that shown by the rolls currently made in Brazil. The targets of the project were: a) to produce high-speed steel rolls for hot strip rolling with a competitive advantage of at least 10 per cent, in terms of the cost/benefit coefficient, compared

with the products currently produced in Brazil; b) to attain reliability and reproducibility in the manufacturing process (levels of rejects lower than 5 per cent of the total of rolls produced). The activities of establishing the bases of the research project were carried out at the premises of the Metallurgy Division of the IPT and of the Laboratory of Superficial Phenomena of the Mechanical Engineering Department of Epusp, as well as in Villares's roll factory. The pilot production of rolls was carried out at the same factory, in Pindamonhangaba (SP), with subsequent operation in the steel mills, followed by analyses of their behavior and performance.

58 Study of the Process of Continuous Casting of Thin Plates

Coordinator:
Rezende Gomes dos Santos

Institution:
School of Mechanical Engineering / State University of Campinas (Unicamp)

Company:
CST – Cia. Siderúrgica de Tubarão

Approved value:
Company: R$ 80,000
FAPESP: R$ 160,000 / US$ 25,500
Sum total: R$ 240,000 / US$ 25,500

Start: 1/7/1997
Finish: 30/6/1999

Steel mills the whole world over seek to put into operation the process of continuous casting integrated with rolling, in view of the possible significant cost reductions that this would bring about, notably due to the great reduction in energy consumed. This integration would also provide for a marked improvement in the quality of the products, in view of the reduction in the stages of the process: the reheating of the plate would be eliminated. In addition to the construction of new micro-mills, it is known that the market shows the possibility of some integrated mills incorporating a thin plate rolling machine next to the LD converter. At the moment, the process of the continuous casting of thin plate is the most accepted solution amongst the Near-Net-Shaping Casting processes. One of the advantages of the continuous casting of thin plate is the possibility of coupling together the continuous casting and the rolling. With the integration of this unit with an electric steel works or an LD, both capital investment and operating costs can be reduced, resulting in high productivity and shorter times for order completion. The main argument in favor of the productivity of this type of plant is savings achieved.

59 Development of a Test Methodology for Alloys that Resist Carburetion and Catastrophic Carburetion

Coordinator:
Zehbour Panossian

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Engemassa Engenharia e Materiais Ltda.

Approved value:
Company: R$ 170,401
FAPESP: R$ 27,146 / US$ 50,760.75
Sum total: R$ 197,547 / US$ 50,760.75

Start: 1/5/2000
Finish: 30/4/2003

The objective of this project was to develop a test methodology for assessing the behavior of alloys that resist heat, under conditions in which the phenomena of carburetion, catastrophic carburetion and fluidity are acting simultaneously. Furthermore, it aimed to increase the degree of mastery over the effects of the chemical composition of alloys that resist heat and of the characteristics of the application of these alloys on the phenomena of carburetion and catastrophic carburetion. It also aimed to increase knowledge of the mechanisms for the occurrence of this latter phenomenon. The target is to set up a "ranking" of the performance of the heat resisting alloys produced by Villares, related to the demands involving carburetion, catastrophic carburetion and fluidity. It provides for two series of experiments involving heat resisting alloys marketed by the company: tests to assess the susceptibility to carburetion and to catastrophic carburetion, using a gaseous carbonizing atmosphere with test bodies positioned inside a tubular oven, and tests to assess the behavior of the alloys, when they are submitted simultaneously to carburetion and fluidity, with cast tubes positioned in a fluidity testing machine.

60 Synthesis and Characterization of Advanced Carbonous Materials

Coordinator:
Carlos Alberto Luengo

Institution:
Physics Institute/State University of Campinas (Unicamp)

Company:
Usiminas

Approved value:
Company: R$ 410,000
FAPESP: R$ 292,032.90
Sum total: R$ 702,032.90

Start: 1/5/1995
Finish: 31/12/1998

The objective of this integrated research was the synthesis and characterization of Advanced Carbonous Materials (ACM), working on Brazilian raw materials to reach new developments in the area. In the first instance, a separation was carried out of the undesirable phases present in coal tar and a suitable choice of residue from the distillation of petroleum to obtain middle stage pitch. This pitch was synthesized through heat treatments of distillation/polymerization, taking as a comparative standard the results of the characterizations of imported middle stage pitch. The next stage was the conversion of the middle stage pitch, both the imported pitch and the one produced in the course of the research project, into ACM products, such as carbon fiber, carbon-carbon compound, microsphere of mesocarbon, synthetic graphite and carbon 60, with the consequent development of processes for each kind of material. The delicate microscopic arrangements involved in the formation of the middle stage pitch and later treatments (up to the final products) called for the use of advanced characterization techniques, such as polymerized optic light microscopy, nuclear magnetic resonance, X-ray diffraction and infra-red spectroscopy with Fourier transforms, to determine the degree and the type of condensation of the aromatic structures.

61 Industrial Applications of Nitriding Methods with Plasma Ovens and Ionic Implantation for the Treatment of Steels Used in Car Transmission Systems

Coordinator:
Daniel Wisnivesky

Institution:
Gleb Wataghin Institute of Physics/ State University of Campinas (Unicamp)

Company:
Eaton Ltda. - Divisão de Transmissões

Approved value:
Company: R$ 1,133,000 / US$ 40,000
FAPESP: R$ 488,300 / US$ 155,120.70
Sum total: R$ 1,621,300 / US$ 195,120.70

Start: 1/7/2001
Finish: 30/6/2003

The nitriding of metals is a process that makes it possible to alter the properties of surface hardness, wear, corrosion and heat resistance of the material. In order of importance, it is used in the treatment of ferrous metals, refractory metals, and, more recently, aluminum. The process of nitriding surfaces is applied, amongst others, in the mechanical, automobile and hydraulic industries, in the deformation of metals, foundries, steel making, biomedicine and foodstuffs. The process is used in the treatment of plastic injection molds, of automobile parts (valves, gears, pistons, etc.), aluminum extrusion molds, tools for the cutting and milling of metals, puncture of matrixes for cutting generally, treatment of prostheses, etc. In the last two decades, there has been progress in the technology used in the processes for treatment of surfaces, in particular with the development of the method of nitriding by plasma in a vacuum oven and methods of ionic implantation. Thermo-chemical treatment by plasma offers various advantages when compared with the traditional methods nitriding by salt bath or gaseous nitriding. Studies carried out recently, comparing the various methods of nitriding, show that it is possible to improve the metallurgical properties of the metals considerably, using implantation with a beam of ions and nitriding with intensified plasma.

62 Development of a New Synthesis Process of Polypropylene with High Resistance to Melting

Coordinator:
Ademar Benévolo Lugão

Institution:
Institute of Energy and Nuclear Research (Ipen)

Company:
OPP Petroquímica

Approved value:
Company: R$ 136,000
FAPESP: R$ 36,500 / US$ 67,360
Sum total: R$ 172,500 / US$ 67,360

Start: 1/11/1999
Finish: 31/10/2001

The main applications of HMS-PP are: extrusion of plates, films, thermo-formation, coatings, foams and blowing. The participation of PP in these segments has been limited by its low resistance to melting, which prevents or jeopardizes these processes. These applications represent a market of over 1 million tons in the Northern Hemisphere. In Brazil, OPP estimates that the market for this is around 30,000 tons. The objective of this work was to develop the process of synthesizing HMS-PP based on the original process put forward by Ipen.

63 PRUMO – Projects of Mobile Units for Technological Assistance for Micro and Small Businesses (MSBs) of the Surface Treatment Sector

Coordinator:
Zehbour Panossian

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – São Paulo (Sebrae–SP)

Approved value:
Company: R$ 972,720
FAPESP: R$ 107,084 e US$ 104,660.43
Sum total: R$ 1,079,804 / US$ 104,660.43

Start: 1/5/2001
Finish: 30/4/2003

Prumo – the Project of Mobile Units for Technological Assistance – is an original proposal that aims, through an innovative work dynamic, to achieve incremental innovations in micro and small businesses (MSBs), to create the conditions for productive processes to evolve, and, possibly, of diagnosing opportunities for radical innovations, that may bring about changes in the technological level in the sector assisted. Essentially, the project consisted of a program of technological assistance for the micro and small company – MSBs, lasting from one to three days, through mobile laboratory units (MUs), which go to the companies' premises, carrying out tests, examinations and experiments, diagnosing problems and/or detecting possible faults and presenting solutions. The project also intended to identify technological problems in the sector, not solvable through the MUs, translating them into a set of themes of common interest to a certain number of MSBs, developing work proposals for these companies and identifying possible development agencies for financing these projects. The project was developed by the IPT – Institute of Technological Research of the State of São Paulo S. A., in partnership with Sebrae/SP and with the support of associations from the sector of the treatment of surfaces.

64 Parallelization of the Adjustment of the Background of Production in Management Networks Using PVM

Coordinator:
Denis José Schiozer

Institution:
School of Mechanical Engineering/ State University of Campinas (Unicamp)

Company:
Petrobras – Petróleo Brasileiro S/A

Approved value:
Company: R$ 261,000
FAPESP: R$ 1,383.40 / US$ 160,989.60
Sum total: R$ 262,383.40 / US$ 160,989.60

Start: 1/6/1996
Finish: 31/5/1999

This research project aimed to develop a system and to qualify professionals in the area of parallel computing in a network of workstations using PVM and the oil fields' numerical simulators. It was initially developed on a network of workstations at Unicamp, and used the Black-Oil simulator of CMG, IMEX. The project was divided basically into four stages. In the first three, the objective was to develop a methodology capable of facilitating the work of the engineer in adjusting the background of petroleum production. At the end of the third stage, the engineer should have, in real time a little more than the equivalent of a run of a simulator, a sensitivity study of one of the chosen parameters. At the end of these three stages, there will also be a study intended to choose the best architecture for this kind of problem. The last stage is intended for the appli-

cation of the results obtained in the previous stages, extending the project to a more complex problem, which may be the parallelization of the semi-automatic adjustment of production backgrounds, or methods of optimization for the choice of alternatives for production. This definition will depend on the results obtained beforehand. With the technology acquired in the area, the results should also be extended to other network architectures and other oil field simulators.

65 Recycling of Aluminum: Development of Technological Innovations

Coordinator:
Antonio Carlos da Cruz

Institution:
Institute for Technological Research/State of São Paulo Secretariat for Science, Technology and Economic Development (IPT/SCTDESP)

Company:
Associação Brasileira do Alumínio – Abal

Approved value:
Company: R$ 192,700
FAPESP: R$ 161,924 / US$ 129,107.36
Sum total: R$ 354,624 / US$ 129,107.36

Start: 1/7/2000
Finish: 30/6/2002

The conventional process for the recovery of aluminum is based on the heating of the recovery furnaces by means of air/oil combustion. To increase the metallurgical yield of this process, there is an addition of salts (NACI and KCI) to the load, in a proportion of between 10 and 40 kg for each 100 kg of residue processed. These salts are easily lixiviated by water, and, for this reason, they call for the disposal of the residue from the process (black sludge) in industrial landfills. Due to its high cost, this practice is not always observed, above all by small businesses from the sector. In addition, the conventional process is highly pollutant, due to the presence of salt vapors in the exhaust gases. As they are corrosive, these vapors cause the premature wear of the gas cleaning equipment and a consequent increase in processing costs. The project's main objective was to research and develop a clean (without the use of salts) process of its own for recycling aluminum. The project made use of the previous experience of its proponents, in the development of similar equipment, applied to the remelting of aluminum refuse (IPT), and in the study for optimization of recycling processes (Epusp) and included the comparative study of two techniques for the heating of the recovery furnace: heating with an electric arc (plasma) and by oxy-gas. Besides the recycling of aluminum, the project pursued the prospective study of the reuse of the solid residue generated by the process, as raw material for refractory products, abrasives and/or white ceramics. The project involved the assembly of a recovery furnace with a nominal capacity of 100 kg/h, the operation of this equipment in the processing of waste from different origins with two alternative sources of energy; the analytic monitoring of the process, with a view to studying the variables in the process and the assessment of the performance of each alternative. The project also provided for a technical/economic study to be carried out, aiming to scale the equipment for the capacity needed to meet the industrial demand for the treatment of these residues.

66 Strategic Reorganization and Technological Innovation in the Product Line

Coordinator:
Alfredo Colenci Junior

Institution:
São Carlos School of Engineering/ University of São Paulo (USP)

Company:
Chocolates Finos Serrazul Ltda.

Approved value:
Company: R$ 59,300
FAPESP: R$ 65,300
Sum total: R$ 124,600

Start: 1/9/1998
Finish: 31/8/2000

In the market for almost 50 years, Chocolates Finos Serrazul Ltda. has been going through a key moment in its existence, under pressure from the forces of the so-called globalized market. In response to this, it has made investments in two simultaneous and inseparable directions: management and technology, in order to realign itself and redefine its activities in the sector. In strategic terms, it should gradually abandon the production of intermediate industrial goods, such as the granulated and coating lines, and act in the line of finished chocolate pro-

ducts, such as Easter eggs and fine chocolates (differentiated and personalized), ceasing to act at levels of "increasing diseconomies", to act at levels of "increasing economies" with products of higher added value. In terms of technology, the improvements called for go as far as a refinement in the manufacturing process and a systematic search for new sources and specifications of raw materials, which will be carried out under the technological and helping control of specialists.

67 Evaluation of the Recycling of Industrial Residues Derived from the Synthesis of Styrene and the Rolling of Metallic Aluminum, with a View to their Application in the Protection of the Covering of Civil Constructions

Coordinator:
Fazal Hussain Chaudhry

Institution:
São Carlos School of Engineering/ University of São Paulo (USP)

Company:
Martinez & Micheloni Ltda.

Approved value:
Company: R$ 7,320
FAPESP: R$ 16,025 / US$ 399
Sum total: R$ 23,345 / US$ 399

Start: 1/1/2/1997
Finish: 30/6/1998

Industrial activities generate a variety of subproducts in great quantities, which often mean waste requiring disposal. This fact is even truer in the case of petrochemical industries, where these waste products do not follow a consistent pattern. The purpose of this project was to test the use of subproducts from the synthesis of styrene and from the manufacture of telephone cables, to be used, in an innovative technology, as protection for the coverings of buildings. This technology exploits the adhesive quality of the resin and the impermeability of the compound, discarded by the cable industry, made up of two layers of a copolymer on both sides of a rolled aluminum product. The feasibility of this technology was initially tested over a small concrete slab to which the resin/compound system was applied. The properties of the system in field conditions were tested on top of the covering of a building with dimensions of 5 m x 6 m that had cracks and as a consequence let water leak through. Suitable techniques were developed for the application of the system. The field experiment proved that the proposed system is effective in eliminating infiltration in coverings, as well as being economically and environmentally appropriate.

68 Development of a Reactor for Sterilizing Waste Water

Coordinators:
Gilberto de Martino Jannuzzi / Roberto Feijó de Figueiredo

Institution:
School of Mechanical Engineering/ State University of Campinas (Unicamp)

Company:
NCR Esterilização D´Água por UV Ltda.

Approved value:
Company: R$ 48,000
FAPESP: R$ 36,025
Sum total: R$ 84,025

Start: 1/6/1998
Finish: 31/5/2000

This is a project to adapt an already existing technology for the sterilization of drinking water, and to use it in a system for treating waste water. The practice of treating sewage in Brazil is still in its infancy, and the intention was to make a contribution towards a solution of this problem. Specific objectives: the construction of a prototype reactor for sterilizing waste water, using a collection point in Unicamp's Hospital de Clínicas, monitoring the performance of the equipment and analyzing its bactericidal powers, and doing a cost/benefit analysis of the equipment. Initially, the quality of the in-going water was ascertained by measuring its main physical, chemical and bacteriological parameters. Secondly, an attempt was made to determine any preliminary treatment prior to making use of the sterilization system. Next, tests were carried out with the prototype reactor using ultraviolet lamps to sterilize the waste water, and bacteriological analyses (and possible alterations to the prototype), and tests with different levels of flow, and, finally, an analysis of the economic feasibility of the treatment system.

69 Geochronology Laboratory with High Resolution Ionic Microprobe: Support for Development of High Technology Geoscientific Projects in Oil Exploration

Coordinator:
Colombo Celso Gaeta Tassinari

Institution:
Institute of Geosciences / University of São Paulo (USP)

Company:
Petrobras - Petróleo Brasileiro S.A.

Approved value:
Company total: R$ 1,500,000
FAPESP total: R$ 1,500,000
Sum total: R$ 3,000,000

Start: 1/2/2005
Finish: 31/1/2008

The objective of this project is the implementation of a Geochronological Laboratory with a high resolution ionic microprobe on the campus of the University of São Paulo (USP), in the city of São Paulo. The proposal is to develop, in the area of geosciences, projects geared towards the exploration/exploitation of oil. They should be related to the study of the source of the sediments forming the reservoir bedrocks and to the study of the precise dating of diagenetic processes and of the characterization of the tectonic evolution of potentially oil-bearing sedimentary basins. The project will also train human resources in high geoscientific technology geared to applications in the oil industry in order to meet market demand. It is important to highlight that the implementation of the laboratory will afford technological innovations in other areas, such as in the study of the evolution of the continents and in the mineral industry. In addition to Petrobras and USP, the São Paulo State University (Unesp) and the State University of Campinas (Unicamp) will also be partners in this work.

70 Synthesis and Characterization of Copolymers of Alphamethylstyrene-Styrene Aimed at its Application in the Encapsulation of Silica Particles

Coordinator:
Amilton Martins dos Santos

Institution:
Lorean School of Chemical Engineering – State of São Paulo Secretariat for Science, Technology and Economic Development

Company:
Rhodia Brasil Ltda.

Approved value:
Company: R$ 64,997
FAPESP: R$ 35,850 / US$ 1,120
Sum total: R$ 100,847 / US$ 1,120

Start: 1/7/2002
Finish: 30/6/2003

The main objective of this project was to develop hydrophobic and or hydrophobic-hydrophilic copolymers using as comonomers styrene, methylstyrene, methyl-metacrylate, butyl acrylate, acrylic acid and acrylonitril for use as additives in plastics for different applications. These copolymers (additives) are added to plastics and elastomers to improve some of their properties, such as thermic resistance, dispersion, moldability and density, among others. Polymers formed by styrene, alphamethylstyrene and methyl-metacrylate are used as additives for plastics aiming for an increase in flexibility without altering their thermic resistance and as elastomers, adhesives and sealants, to confer a high degree of moldability, among other characteristics, to foams. It was sought to control the characteristics of the copolymers, such as composition (monomer ratio and their distribution in the chain) and molecular weight by means of the adjustment of the parameters involved in the copolymerization reactions: flow of reagents, temperature of reaction, agitation and nature of the solvents (polarity, pH and ionic force). In this manner different polymers were sought with physico-chemical properties compatible with the different applications previously mentioned.

71 Properties of Mixed Systems Prepared from Mixtures of Carrageenans and Tensoactives

Coordinator:
Maria Elisabete Darbello Zaniquelli

Institution:
School of Philosophy, Science and Arts/University of São Paulo (USP – Ribeirão Preto, SP)

Company:
Rhodia Brasil Ltda

Approved value:
Company: R$ 75,538
FAPESP: R$ 22,700
Sum total: R$ 98,238

Start: 1/12/2002
Finish: 30/11/2003

Carrageenans are a special type of polysaccharide extracted from seaweed which reveal units of galactose and variable substitution of sulfated groups. In this way they behave like polyanions. Owing to their great affinity with water, carrageenans belong to the group of hydrocolloids, in which gelatins and other gums are also included. They are used as dispersal, jelling and thickening agents, principally in the food industry. The present project studied the interaction of some fractions of carrageenans with synthetic tensoactives with the aim of understanding: 1) the formation of possible polyelectrolyte-tensoactive complexes; 2) the variation in the jelling capacity through the introduction of low molar mass tensoactives in the presence of different electrolytes; and 3) the separation of phases caused by the mixture with tensoactives and the determination of the microstructure. In parallel, chemical modifications were carried out on carrageenan molecules with the aim of obtaining fractions with some amphiphilic character. The carrageenans, modified or not, were characterized in relation to the type and proportion of contra-ions, size exclusion chromatography, RMN, FTIR and finally HPLC. The results obtained in this project, in addition to their fundamental scientific aspect, may contribute to the broadening of the application of carrageenans in different formulations, such as the cosmetic and pharmaceutical areas.

72 Prediction and Solubility of Polar Polymers and Crystalline Solids in Solvent Mixtures

Coordinator:
Martín Aznar

Institution:
School of Chemical Engineering/ State University of Campinas (Unicamp)

Company:
Rhodia Brasil Ltda.

Approved value:
Company: R$ 50,505
FAPESP: R$ 14,200
Sum total: R$ 64,705

Start: 1/7/2002
Finish: 30/6/2003

The project developed a predictive safe and suitable methodology for the formulation of industrial solvents for the solubilization of crystalline solids. The proposal was, in the first instance, to apply the Hansen methodology, originally developed for polymers, to systems with polar polymers and crystalline solids, using experimental data on the solubility of solids in solvents. Data on the solubility of solids of interest was acquired. A computer program was developed to obtain the parameters of solubility of the solid based on experimental information. In addition, the creation of two alternative methodologies for predicting the solubility of solids was proposed. The first calculates the solubility using the parameters estimated on the basis of the experimental data. The second predicts the solubility on the basis of the thermodynamic criterion of solid-liquid equilibrium, using the Unifac model. Software was developed encompassing all the methodologies worked on.

73 Prumo – Project of Mobile Units for Technological Assistance for Micro and Small Businesses in the Wooden Furniture Making Sector in the State of São Paulo

Coordinator:
Takashi Yojo

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – São Paulo (Sebrae–SP)

Approved value:
Company: R$ 972,700.00
FAPESP: R$ 472,855
Sum total: R$ 1,445,555

Start: 1/7/2004
Finish: 30/5/2006

With organized and programmed action to support micro and small businesses in their own premises, it is planned – using a battery of tests, analyses and examinations – to detect deficiencies in raw materials, equipment and processes and to indicate the necessary modifications, implementing them, wherever possible, as a didactic tool of maximum viability and efficiency. This dynamic of assistance should result in innovations both in the process and in the formulation of the components of the raw materials and in the properties of the final products. This action is delivered by means of Prumo, which consists of mobile laboratory units (MUs) operated by specialized engineers and technicians. The in loco assistance is intended to last from one to three days. In this project, the focus of the proposal is on the furniture making sector, aiming for an improvement in its production processes and products. A survey will be undertaken to identify problems common to the sector and to detect any organizational, management and operational deficiencies the micro and small businesses . The project is developed by IPT in partnership with Sebrae-SP and with the support of the furniture making sector.

74 Study of the Influence of the Characteristics of Phosphated Layers in Stamping Operations with and without Lubricants

Coordinator:
Zehbour Panossian

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Brasmetal Waelzholz Indústria e Comércio

Approved value:
Company: R$ 160,889.96
FAPESP: R$ 113,710
Sum total: R$ 274,599.96

Start: 1/2/2005
Finish: 31/1/2007

Phosphatized layers on ferrous metals are used, among other purposes, to facilitate conformation operations with the use of the traditional zinc phosphate-based baths. Normally the application process of the phosphatized layers immediately precedes the conformation stage, and it is done by the same company that carries it out. In this case, the post-treatment of the phosphatized layers consists of the application of a lubricant without anticorrosive properties, since there is practically no waiting time between the application of the phosphatized layer and the conformation operation. However, although not very common, phosphatization can be carried out by the company supplying the metal sheets. This situation occurs in Brasmetal, which sells steel sheets already phosphatized and lubricated, ready for cutting and conformation. Thus, the post-treatment of the phosphatized layers must take into account the possible occurrence of corrosion of the sheets in the storage and transport phases. Therefore, a lubricant with anticorrosive properties should be applied or some other product should be applied over the lubricant that will protect the phosphatized and lubricated sheet. The aim of this project is to carry out a systematic study for the purposes of correlating the performance of different phosphatized layers with different lubricants aiming for the mechanical conformation of phosphatized layers.

75 Behavior of Aeronautical Materials and Structures Subjected to Impact

Coordinator:
Marcílio Alves

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Embraer - Empresa Brasileira de Aeronáutica S/A

Approved value:
Company: R$ 261,900 / US$ 57,580
FAPESP: R$ 367,896
Sum total: R$ 629,796 / US$ 57,580

Start: 1/6/2003
Finish: 30/11/2005

The purpose of this project is to undertake the technological development that will allow Embraer to simulate and analyze the response of aeronautical structures when subjected to impact. The shapes of the impacting projectiles include extremely hard spheres and flexible bodies which mimic the impact of small fragments and birds respectively.

The projectiles are fired against aeronautical structures and the various impact tests provide assistance for the simulations to be undertaken. In order to proceed to numerical analysis, the mechanical properties of the material that makes up the structure under evaluation are determined by means of static and dynamic traction tests, covering a range of 0 to 5.000/s of deformation rate. The project also proposes the development of the theoretical model of failure based on the mechanics of damage to predict the failure of the material in impact situations. The model considers the effect of large deformations, temperature and rate of deformation and will be implemented and tested alongside the experimental results in the program of finite elements used in the analyses.

76 Prumo – Project of Mobile Units for Technological Assistance for Micro and Small Businesses in the Shoemaking Sector of the State of São Paulo (Franca-Birigüi-Jaú)

Coordinator:
Kléber de Barros

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – São Paulo (Sebrae–SP)

Approved value:
Company: R$ 972,700
FAPESP: R$ 320,000
Sum total: R$ 1,292,700

Start: 1/5/2003
Finish: 30/4/2005

Projects under the umbrella of the initials Prumo consist of mobile laboratory units (MUs) operated by specialized engineers and technicians who offer technological assistance on the premises of micro and small businesses, remaining for between one and three days. By means of a battery of tests, analyses and examinations, deficiencies in raw materials, equipment and processes are detected and the necessary modifications indicated. In the current project, the objective was to improve the performance in the shoemaking sector in the State of São Paulo and consolidate its position in the State's economy. With the implementation of the MUs and the methodology to be applied, it was sought to achieve a technological increment in the sector. Since there is a period of stay in the companies assisted, we may consider that these laboratory units fit into the company routine being able, in the making of shoes, to substitute raw materials and alter production processes in pursuit of accumulated improvements. Thus, the companies can minimize production costs, direct their purchases towards better quality products, increase productivity and avoid reworking and rejects, among other items of relevance to micro and small businesses.

77 Prumo – Project of Mobile Units for Technological Assistance for Micro and Small Businesses in the Industrial Sector of Plastics Transformation

Coordinator:
Armênio Gomes Pinto

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – São Paulo (Sebrae–SP))

Approved value:
Company: R$ 946,220
FAPESP: R$ 170,000 / US$ 223,664.69
Sum total: R$ 1,116,220 / US$ 223,664.69

Start: 1/3/2002
Finish: 28/2/2004

Prumo is an original proposition which aims, through a dynamic of innovative work, to obtain incremental innovations in micro and small businesses (MSBs) in various sectors of the State of São Paulo economy and to create conditions for the evolution of productive processes. From time to time, it may diagnose opportunities for radical innovations that bring about changes in the technological platform in the assisted sector. The project essentially consists of a program of technological assistance at the company's premises spread over one to three days provided by engineers and technicians by means of mobile laboratory units (MUs). The unit carries out tests, examinations and experiments, makes a diagnosis of problems and/or detects possible failings and offers solutions. In the current

project, focused on the plastics transformation sector, it was also sought to identify specific technological problems in that area, not capable of being solved by the MUs. The intention was to translate them into a set of themes of common interest to a certain number of MSBs, to develop work proposals for them and identify possible support agencies for the financing of the projects drawn up.

78 Dedini Rapid Hydrolysis (DHR Process) – Design, Implementation and Operation of Unit Development Process (UDP)

Coordinator:
Carlos Eduardo Vaz Rossell

Institution:
Technology Center of the State of São Paulo Cooperative of Sugar-cane, Sugar and Alcohol Producers producers (Copersucar)

Company:
Codistil S/A – Dedini

Approved value:
Company: R$ 1,822,100
FAPESP: R$ 1,751,487
Sum total: R$ 3,573,587

Start: 1/2/2002
Finish: 30/6/2003

The DHR process (Dedini Rapid Hydrolysis), which consists of the design, implementation and operation of a development unit (UDP), brought considerably lower costs for the production of alcohol than those currently obtained in the best plants, resulting in a significant socioeconomic contribution for the country. The application of this process, considered by Copersucar to be a true breakthrough in the sugar alcohol industry, enables the production of alcohol from bagasse, releasing the cane for sugar production without increasing the planted area, which brings considerable profitability to the plants. In this way, exports of sugar and alcohol can be increased, and competitive alcohol reduces the concern with the increase in the price of imported oil, leading to a positive impact on the external balance of payments. The UDP has for the hydrolysis area for the recuperation of solvent, an area for treatment of hydrolyzed material, an area for fermentation and an area for the collection and treatment of the effluent.

79 Development of System of Control of Process of Crystallization in Suspension Through Monitoring of Concentration and Distribution

Coordinator:
Marcelo Martins Seckler

Institution:
Polytechnic School/University of São Paulo (Poli/USP)

Company:
Rhodia Poliamida e Especialidade Ltda.

Approved value:
Company: R$ 149,400
FAPESP: R$ 136,105
Sum total: R$ 285,505

Start: 1/6/2003
Finish: 30/11/2004

The present project aimed to develop a system for the induction and control of the concentration and distribution of crystal sizes (DTC) in batch crystallization operations. The system is based on measurement of the concentration of the solution by refraction index for the monitoring of the supersaturation and on data from total count and numerical distribution of the sizes of particle strings. This data is obtained by the system of reflection of laser immersed in the suspension contained in the crystallizer (in-line measurement). This information provides the entry variables for a neural network model adjusted to induce the volumetric DTC and the mass concentration of crystals in suspension. These variables constitute the base for the calculations of supersaturation in the crystallizer and for the models based on populational balance. Based on the acquisition of reliable data susceptible to modeling, it becomes possible to act on the manipulable variables by means of an adequate control strategy, seeking improvement in the quality of the product and uniformity between batches.

80 Prumo - Project of Mobile Units for Technological Assistance for Micro and Small Businesses in the Industrial Sector of Rubber Transformation

Coordinator:
Selma Barbosa Jacomis / Armênio Gomes Pinto

Institution:
Institute of Technological Research of the State of São Paulo (IPT)

Company:
Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – São Paulo (Sebrae–SP))

Approved value:
Company: R$ 946,220
FAPESP: R$ 170,000 / US$ 223,664.69
Sum total: R$ 1,116,220 / US$ 223,664.69

Start: 1/3/2002
Finish: 28/2/2004

Prumo is an original proposition which aims, through a dynamic of innovative work, to obtain incremental innovations in micro and small businesses (MSBs) in various sectors of the State of São Paulo economy and to create conditions for the evolution of productive processes. From time to time, it may diagnose opportunities for radical innovations that bring about changes in the technological platform in the assisted sector. The project essentially consists of a program of technological assistance at the company's premises spread over one to three days, provided by engineers and technicians by means of mobile laboratory units (MUs). The unit carries out tests, examinations and experiments, makes a diagnosis of problems and/or detects possible failings and offers solutions. In the current project it also identified technological problems in the rubber transformation sector not capable of being solved by the MUs. The intention was to translate them into a set of themes of common interest to a certain number of MSBs, to develop work proposals for them and identify possible support agencies for the financing of the projects drawn up.

81 HUMAN SCIENCES

Primary Level Reading and Writing Project for Members of Staff at Cia. Nestlé de Alimentos

Coordinator:
Stela Conceição Bertholo Piconez

Institution:
School of Education/ University of São Paulo (USP)

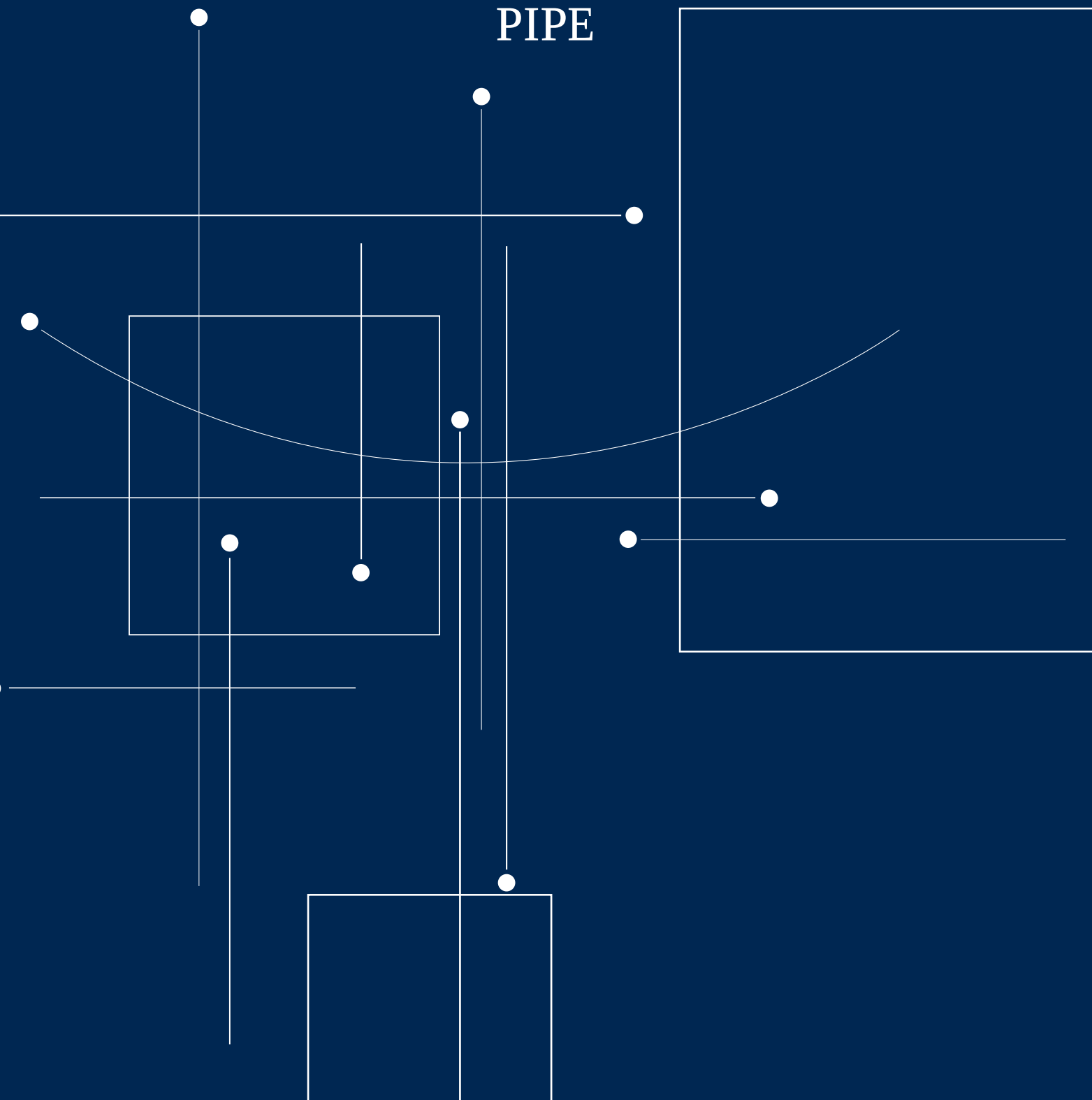
Company:
Nestlé Industrial e Comercial Ltda.

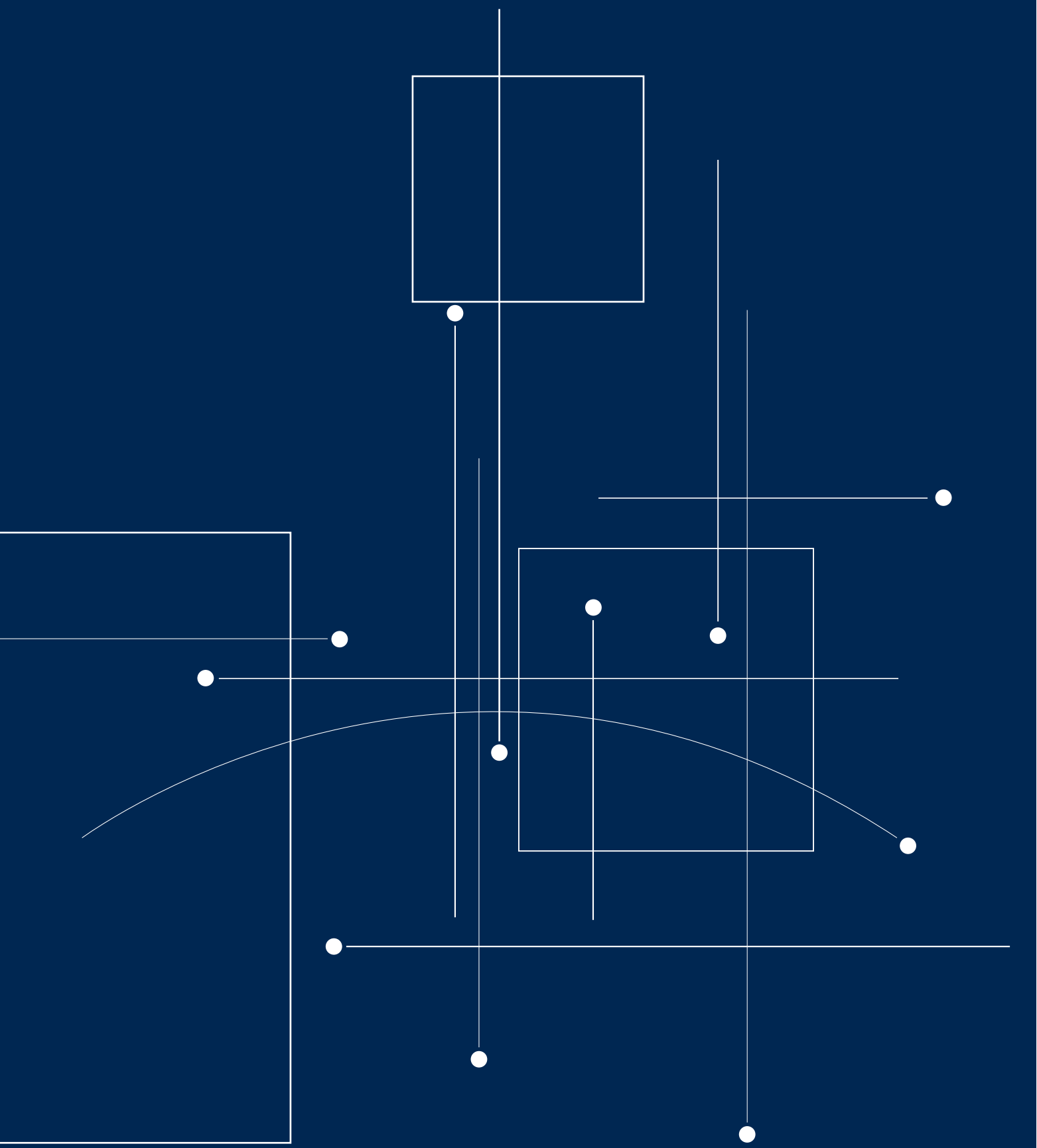
Approved value:
Company total: R$ 104,412.48
FAPESP total: R$ 37,173
Sum total: R$ 141,585.48

Start: 1/2/1996
Finish: 31/3/1998

A project directed towards the development of ongoing research on the process of the teaching of reading and basic schooling for adults with little or no schooling – in the specific case, among collaborators (staff from the Total Quality program) with Cia. Nestlé de Alimentos, at 17 industrial units located in four states: São Paulo, Rio de Janeiro, Minas Gerais and Bahia. Making use of the principles and resources of distance learning, both for training the teachers to teach adults to read and write, as well as in attending to the primary school education, the aim was to provide an opportunity for consolidating a partnership between university and company in the sector.

TECHNOLOGICAL INNOVATION IN SMALL BUSINESSES PIPE





1st BIDDING INSTRUCTIONS

1 Human Growth Hormone Production using Recombinant DNA Technology

Coordinator:
Jaime Francisco Leyton Ritter

Company:
Genosis Biotecnológica Ltda.

Approved value:
Phase 1: R$ 19,300 / US$ 27,538
Phase 2: R$ 46,838 / US$ 74,200

The use of pharmaceutical products produced by recombinant DNS technology has become a reality in today's world. Brazil, however, has no pharmaceutical laboratory producing pharmaceutical products using this technology. This project intends to create a company able to produce pharmaceutical formulations using this method. The choice of the Human Growth Hormone (hGH) as the first product, in addition to its therapeutic importance, is due to the fact that most of the research has already been completed – from isolating the gene and its expression in bacterium to the purification of the recombinant, biologically active product on a laboratory scale. The result of this project, recombinant human growth hormone (rHGH), is an indispensable product for promoting growth in cases of dwarfism caused by a deficiency of hGH. Other therapeutic uses for this product (aging, osteoporosis, recovery from fractures, loss of muscular mass in AIDS) are being researched. All the hGH currently used in Brazil is imported and there is a shortage in the market. It is intended to scale up the fermentation process to industrial scale, partially to scale up the purification process carrying out the appropriate purity tests and performing clinical tests.

2 Optimization of the Yields from Bacterial Expression, and the Fermentation and Purification of Recombinant Human Growth Hormone in order to Enable its Production and Sale

Coordinator:
Paolo Bartolini

Company:
Hormogen Biotecnologia Imp. Exp. Ltda.

Approved value:
Phase 1: R$ 44,360
Phase 2: R$ 182,813

The research group of the Bioengineering Department of the Institute of Energy and Nuclear Research/National Nuclear Energy Comission (Ipen/CNEN/SP) has been working on the production and characterization of human pituitary hormones in general and of the human growth hormone in particular. Since 1994, this laboratory has had an agreement with the company Hormogen Biotecnologia Imp. Exp. Ltda. Hormogen's main purpose is the production and sale of hGH obtained through recombinant DNA techniques in transformed bacteria. The product's high social potential has already been shown, and it is indispensable in the treatment of various forms of dwarfism and recommended in serious conditions of debility. Its use in cases of osteoporosis, bone fractures, burns, and kidney deficiency is being studied and is partly being carried out as are its effect on rejuvenation and on the increase of muscle mass. This hormone, as is the case with practically all pharmaceutical products obtained through genetic engineering techniques, is not yet produced in Brazil. This research is intended to build significant vectors enabling an industrial increase in the bacterial periplasmic secretion of the product, optimizing the fermentation process in the bioreactor, increasing at the same time the biomass and the production of hGH by bacteria, and improvements to the purification stages.

3 Use of Computer Learning and OCR Mathematical Morphology in the Computer Stage

Coordinator:
Felício Hissaaki Sakamoto

Company:
Carta Consultoria Ltda.

Approved value:
Phase 1: R$ 24,000
Phase 2: R$ 51,000

The object of this project is to develop a study to enable the development of the use of automatic optical character recognition (OCR) in faxes sent by computer. Based on this recognition, the application must enable structured storage of information received and the carrying out of swift searches and recoveries of this information. The theory used will be

based on Mathematical Morphology. This theory is useful for modeling changes between images and, for this reason, it has been used quite successfully to solve various image processing problems. By automating the morphological operators project (mapping between images), based on computer learning, it is intended to show the feasibility of developing a program able to be used automatically in offices without users having to have specific knowledge of the technique used. The expected benefits are quite broad, particularly in space saving in storing information, in enabling automatic classification of, and access to, fax contents, and in searching for subjects and specific words, something which was previously impossible with matrix (bitmap) images.

4 Improvement of the Vacuum Press Filter for the Sugar and Alcohol Industry

Coordinator:
Pedro Gustavo Córdoba Junior

Company:
Technopulp Consultoria e Com. de Equipamentos Industriais Ltda.

Approved value:
Phase 1: R$ 50,000
Phase 2: R$ 197,400

The purpose of this piece of research is the technological improvement of the continuous double screen filter known as a Vacuum Press, used in purifying the mixed fresh sugarcane juice (garapa) in sugar and alcohol mills, enabling an increase in efficiency and productivity. The project aims to study the market in greater detail, with laboratory research testing new membranes and filter coadjutants, such as polymers and chemical coagulation agents, to achieve better operating performance. This is only possible through work in the laboratory and at the mill, using a pilot filter for testing. Setting up a laboratory with pilot equipment will enable the team to achieve higher levels of automation and efficiency, enabling the company to broaden the range offered to the market, leading to social and economic benefits by creating new jobs. The vacuum press filter is the company's most recent development in the field of engineering and processes associated with the sugar and alcohol, and paper and pulp sectors, to produce satisfactory results, replacing conventional rotary filters, that are not very efficient at retaining suspended particulate matter and have a high rate of loss of sucrose.

5 Development of Refrigerators Based on Thermo-acoustics Phenomenon

Coordinator:
Humberto Pontes Cardoso

Company:
Equatorial Sistemas Ltda.

Approved value:
Phase 1: R$ 66,635
Phase 2: R$ 193,500

The recent progress in developing long-wave photovoltaic detectors for imagers installed in artificial satellites has created an increasing demand for highly reliable, low-weight and low energy consuming cryogenic refrigeration systems. Micro-cryogenic, thermo-acoustic refrigerators are being developed by the world's main space research centers as an alternative to the passive refrigeration systems (cryogenic radiators) and thermoelectric refrigerators. Recent progress in microelectronics, especially in microprocessors, also requires highly reliable, low-weight micro refrigerators. Thermo-acoustic micro refrigerators consist of a stainless steel tube containing a mixture of gases (normally helium and xenon), a loud-speaker installed at one end and a thermo-acoustic dephaser (TAD) positioned inside the tube at the opposite end. In triggering the loudspeaker, compression and decompression waves are produced in the gas that give rise to successive heat exchanges between the various layers of TAD and the gas in such a way that, in the end, a quantity of heat is removed from the TAD that is greater than the one produced. This technology, as well as being very promising for use in space and in the local cooling of microcircuits, also seems to be an alternative for domestic refrigerators.

6 A Computer System for Analyzing Injuries to the Skin

Coordinator:
Antônio Francisco Junior

Company:
Atonus Engenharia de Sistemas Ltda.

Approved value:
Phase 1: R$12,090
Phase 2: R$ 97,074
Grants: R$ 126,047.80

Brazil, with its people constantly exposed to sun rays, has witnessed increasing rises in the number of skin lesions. In order to help healthcare specialists to diagnose skin lesions, especially skin cancer, Atonus Engenharia de Sistemas Ltda. proposes developing a computer system for capturing, storing and analyzing images of human skin. With the local help of this system and remote transfer over the Internet of digital images obtained by specialists in the medical field, it is intended to reduce the degree of subjectivity in examining skin lesions. Thus, the present project aims not only to develop equipment, but also to publicize and institutionalize the approach to health problems through the remote exchange of texts and images, known as telemedicine. The first phase to be approached has to do with adequate lighting of the human epidermis, followed by capturing the digital images. To do this, Atonus is developing an optical fiber video-dermatoscope, using Brazilian technology, in order to light the human epidermis uniformly. After the digital image of the epidermis has been captured, specific software will be used for morphological and radiometric analysis of the skin lesions, especially with regard to the diagnosis of skin cancer.

7 Project and Development of Equipment for Neonatal Phototherapy Based on Corrugated Optical Fiber

Coordinator:
Cícero Lívio Omegna de Souza Filho

Company:
Kom Montagens e Comércio Ltda.

Approved value:
Phase 1: R$ 21,000 / US$ 26,796
Phase 2: R$ 101,500 / US$ 98,500
Grants: R$ 46,709.40

Physiological jaundice is the most commonly found problem in the neonatal period, affecting 30 to 50 per cent of new-born babies. Around 10 per cent of these children need phototherapeutic treatment, by present-day standards. The light-emitting devices used for this treatment can be essentially of three types: using a fluorescent bulb, a halogen bulb mounted on a spot type reflector, and a cold light emitting manta using optical fiber. The proposed phototherapeutic device uses modified optical fiber consisting of a light radiating blanket that will be in contact with new-born child experiencing a high degree of bilirubinaemia. The light guide to be used in the construction of the manta is of the multimode step index type, with a PMMA nucleus and a Teflon skin. The present proposal uses commercially available optical fiber, and the technological innovation lies in the use of a mechanical process to alter the total internal reflection and producing controlled lateral light emission. The fibers will emit light through the skin inside the blanket. In the project's first phase, mechanical devices and tools were built that produce controlled corrugations on the surface of the fibers and tests were carried out on fibers of different diameters and of different materials. In the second phase, the product itself was developed, which is in the final phases of testing.

8 Development of General Purpose, Low-cost, Controller operated by a Microprocessor with the Capacity for Remote Data Communication in Multipoint Networks

Coordinator:
Durval Makoto Akamatu

Company:
Incon Eletrônica Ltda.

Approved value:
Phase 1: R$ 70,847.60
Phase 2: R$ 233,948

The purpose of this work is the design and construction of prototypes of low-cost, general purpose, microprocessor-operated controllers with the capacity for communicating remote data in multipoint networks, in order to define the internal elements of a product of this sort. This product will be chosen from among the prototypes and will be used initially as a controller of certain physical elements, such as temperature, pressure, and air humidity in refrigeration systems for machine operating panels, cold room systems and air conditioners for telecommunications system containers. The requirements of the product to be developed include having a low-cost controller using a micro-controller, peripherals and a modem chip assembled on an SMD board. The data communication function over a telephone line is carried out by the modem chip, giving the controller a competitive advantage over other products on the market. As a result of this phase of the development of the controller, a prototype will be built and tested to assess the definitive specifications in the project, to suggest adjustments and to give a more accurate view of the costs involved.

9 20-Meter Range Laser Distance Meter for Industrial Use

Coordinator:
Mario Antonio Stefani

Company:
Opto Eletrônica S/A

Approved value:
Phase 1: R$ 6,000 / US$ 40,742
Phase 2: R$ 111,362 / US$ 75,117

The purpose of this project is to develop laser distance meters with a range of from 0.5 to 20 meters. There are various ways of measuring distance with lasers. The most common is the geometric method also known as the laser triangulation method. Nonetheless, when a high degree of accuracy is required, this method is only useful for short distances, from 2 mm to 500 mm. The desired range is justified by the countless potential uses – civil engineering, measurement in grain silos, the level of liquids, detection and positioning of loads in freight cars, security systems, etc. For it to be feasible to use, however, the equipment must be low-cost and portable. Because of the limitations of the triangulation method for longer distances, new methods are needed to make the system feasible and practical. The most common is the telemetry method of short bursts of laser light, and this requires a careful electronic design project. The second method consists of comparing the phase of a modulated waveband of the laser beam with the returning signal. Opto Eletrônica S/A has already carried out the conceptual phase of developing this project. Based on this study a set of requirements was prepared, specifying the main features the product must have: measurement range of up 20m, accuracy of better than 1 cm, response time of no more than 1 second, visible laser of up to 5 MW of average power. The equipment must also be portable and be able to work in sunlight.

10 Daily Production Control at a Chicken Slaughterhouse

Coordinator:
Miguel Taube Netto

Company:
Unisoma Matemática para Produtividade Ltda.

Approved value:
Phase 1: R$ 49,700
Phase 2: R$ 120,760

Unisoma developed and introduced the PIPA system in Sadia, from 1989 to 1997: PIPA is the Portuguese acronym for Integrated Poultry Production Planning. This system is made up of various modules based on mathematical and statistical techniques, aimed at optimally concatenating the decision-taking processes through the entire integrated chicken production chain, ranging from the production of one-day-old chicks to the consumer market. One of the critical points in this production chain is the daily production control in the slaughterhouses. Classification of the products by weight requires dynamic weighing procedures. Unisoma is developing a weighing system using computer viewing techniques, associating the images of the chicken carcasses with their respective weights. This system enables production flows to be programmed better, since weighing takes place immediately before chilling the carcasses, about an hour before these carcasses go to the reweighing and classification point, thus enabling better production flow. This project aims to complete the development of a prototype to be installed at Sadia's Toledo (PR) plant.

11 Development of a 16xE1 Multiplexer/Optical Modem with Technological Innovation

Coordinator:
Rege Romeu Scarabucci

Company:
Asga Microeletrônica S/A

Approved value:
Phase 1: R$ 20,000 / US$ 26,000
Phase 2: R$ 53,510 / US$ 127,060

The development of the 16xE1 Multiplexer/ Optical Modem (MMO 16xE1) will take place in two phases. In phase 1, three studies of innovations to be included in the MMO 16xE1 will be carried out. In phase 2, these and other technological innovations will be implemented in the equipment, the design and production of prototypes, in which they will be the main focus. The MMO 16xE1 is being developed for use in the Primary Optical Route (POR) defined by the Telebrás System. It must, however, meet the specifications of Technical Standard no. 225-540-786 of December 1996, Functional Requirements and Equipment Performance for the Primary Optical Network. The MMO 16xE1 will perform the multiplexing and demultiplexing of up to 16 E1 tributary channels at a speed of 2,048 kb/s, as well as carrying out the conver-

sions of added signals from electrical to optical and vice-versa, enabling communication between the tributary channels by a pair of optical fibers. The main technological innovations to be introduced into the MMO 16xE1 are: 1) measurements of Operational Performance – Measurement of Optical Transmitting Power – Measurement of Optical Reception Power – Measurement of the Optical Interleaving Error Rate; 2) the Introduction of Radial and Ring Structures; 3) managing Failures and the Performance of Optical Interlacing. In particular, an FPGA chip will be developed to measure the error rate with a BIP (Bit Interleaved Parity) code.

12 Development of VDS Sheets (Vibration Damping Steel) for Absorbing Noise and Vibration

Coordinator:
Francisco de Paula Assis Junior

Company:
Fitafer Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 48,200
Phase 2: R$ 198,500

This project can be summed up as the development of a process for laminating two or more sheets together, of the same or different thickness, with the interspacing of plastic polymers or other materials adhering to the internal surfaces, also known as – Vibration Damping Steel (VDS) –, to reduce noise and vibration induced in these sheets at various frequency ranges. This is the development of a new process and a new product as yet unprecedented in Brazil, which will enable the sound insulation of equipment such as motor vehicles, household appliances, and machinery in general, or sound insulation between different spaces as in the case of room dividers.

13 Production of Ultra-Pure Manganese Carbonate

Coordinator:
Silvio Benedicto Alvarinho

Company:
Fermavi Indústria e Comércio de Produtos Químicos Ltda.

Approved value:
Phase 1: R$ 13,300
Phase 2: R$ 170,850 / US$ 24,215

The purpose of this research is to develop a production process for ultra-pure manganese carbonate for use in magnetic ceramics. Two courses of action will be assessed. The first is through leaching manganese monoxide with an ammonium carbonate solution. The manganese is mixed as an anion and made soluble, when the ammonium content is above a given level. Lowering the ammonia content, the manganese is precipitated as a very pure carbonate. The process developed by Dr. R. S. Dean of the U.S. Bureau of Mines, sought, in its original form, to take advantage of low-content, American manganese ore for use in steelmaking. Although very pure, the carbonate this process produces still does not attain the levels that are desirable for use in electronics. Preliminary studies have shown that the introduction of supplementary purification stages has a high probability of achieving a purer form of carbonate. The second course of action for the process aims to improve the classic method of producing manganese carbonate based on a reaction of manganese sulfate in solution with ammonium carbonate. Using this method, it is intended to purify the manganese sulfate solution through adsorption and crystallization.

14 Research and Development into Micro-controlled Systems for Monitoring the Milling of Components Using Acoustic Emission

Coordinator:
Luiz André Melara de Campos Bicudo

Company:
Sensis São Carlos Ind. e Com. Equipamentos Eletrônicos Ltda. – ME

Approved value:
Phase 1: R$ 65,405 / US$ 1,795
Phase 2: R$ 70,100 / US$ 27,434

This research project intends to define the necessary characteristics for developing a digital monitoring system. The equipment must monitor and process the acoustic signals produced by the system and communicate with the control of machine-tools in order to correct problems or improve working conditions. The research intends to establish precisely the most appropriate methods of handling the acoustic signals and monitoring strategies for industrial use. The development of a hybrid filtering system will also be developed, as well as frequency analysis software. Sensis was founded in May 1995 by postgraduate students and former students of the

São Carlos Engineering School, who carried out research into the monitoring and automation of the process of rectification. Sensis developed a first product, called BM12, which is an acoustic emissions monitor using similar technology. In using and monitoring the BM12, Sensis observed the need to develop a new digital technology system, aimed at increasing the reliability and quality of precision manufacturing operations as well as lowering their costs. The digital system will enable the system to interact more with the machine and make it easier to install.

15 Development and Assessment of Pseudo-chelates in Bleaching Pulp Paste with H_2O_2 and in Inhibiting Equipment Corrosion

Coordinator:
Paulo Rogério Pinto Rodrigues/Hugo Antônio Vilca Melendez

Company:
Logos Química Ltda.

Approved value:
Phase 1: R$ 45,872
Phase 2: R$ 112,879.80 / US$ 85,940.80

New pulp bleaching processes, considered clean technologies meeting the requirements of environmental legislation, use hydrogen peroxide as an oxidizing agent. Nonetheless, they require pre-bleaching of the pulp, using chelates, to remove the transitional metallic ions, such as iron, copper and manganese, which act as stabilizers, preventing the fiber from breaking down (attack on the polysaccharides) in the subsequent treatment with peroxide. This research project intends to develop a new product to be called "pseudo-chelates", which differs from the traditional chelate DTPA: (Diethylenetriamine pentaacetic acid) and which it is intended to introduce in the Brazilian market. The study proposes to assess the influence of these pseudo-chelates on the efficiency of the bleaching process (increase of whiteness) and the consequent saving of peroxide. The inhibiting action of these compounds on the corrosion of the metals used in the "pre-treatment of the pulp", bleaching and subsequent stages, will also be assessed.

16 Advanced Materials for the Manufacturing of Bipolar Separators for Ion Conducting Polymer Fuels Cells

Coordinator:
Antonio César Ferreira

Company:
Unitech

Approved value:
Phase 1: R$ 14,342 / US$ 10,182
Phase 2: R$ 83,145 / US$ 67,300

The project's object is to develop bipolar separators using carbon fibers for ion conducting polymer fuels cells and phosphoric acid. Fuel cells are thermodynamically efficient energy converters and do not cause pollution. The material traditionally used has been a special type of graphite specifically for use in fuel cells. With the technological progress in fuel cell components, such as ion conducting electrodes and polymers, however, the graphite separators have come to be one of the main bottlenecks in building cell prototypes. To achieve high power density, more compact cell prototypes need to be built, but the reduction in the thickness of the graphite makes them very fragile. This project is designed to find a new concept for manufacturing bipolar separators using carbon fiber. In the first stage we will use two production processes. In one of them, the separators will be manufactured from a mixture of carbon fiber, phenolic resin, and carbon powder deriving from oil, with subsequent high-temperature sintering to convert the resin into graphite. In the other process, the bipolar separators will be manufactured on the basis of mixtures of carbon fiber, polymers, and carbon powder, with subsequent hot rolling to form sheets. In phase 2, a 2 kW-prototype will be built using the new concept of the separators developed in this project.

17 Development of Technology for Assessing Environmental Risk in Places with Contaminated Underground Soil and Aquifers

Coordinator:
Nelson Ellert

Company:
Hidro Ambiente Projetos, Consultoria e Serviços S/C Ltda.

Approved value:
Phase 1: R$ 45,200
Phase 2: R$ 150,750 / US$ 29,750

This research project is intended to consolidate solutions for the restoration of the official city of Cubatão (SP) garbage dump. To achieve these objectives it is intended to develop and apply methods of risk assessment appropriate to tropical environmental conditions. Risk Assessment methods are currently quite frequently applied in northern hemisphere countries, as a decision-making tool in allocating priorities to the environmental restoration of contaminated areas. These methods will enable more efficient underground soil and aquifer remediation technologies to be identified, having less impact from the social and environmental point of view. This garbage dump, located along the valleys of the River Cubatão and of the dos Pilões creek, at the foot of the Serra do Mar ridge, was used up to the 70s as a dump for household waste. The lack of control enabled dangerous, and sometimes toxic industrial waste mixed with household and hospital waste to be deposited. After having been officially deactivated, around 70 families moved there. The presence of dangerous and toxic waste contaminated some of the families living there. As a result of this episode the families were obliged to leave the area. Downstream from the area, there is a water reservoir belonging to Sabesp. The area is still used for recreation. The presence of heavy metals, volatile organic compounds and pesticides was detected in the groundwater and soil in concentrations above the permitted levels.

18 Automatic System for Monitoring Vehicle Routes

Coordinator:
Ailton de Assis Queiroga

Company:
Compsis Computadores e Sistemas Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 44,193.80
Phase 2: R$ 153,100

The purpose of this research project is to implement an automatic monitoring system for vehicle routes, integrating GPS receiving modules, processing and modem communication with mobile phones, VHF/UHF, and communication satellites. The complete integration of the system embarked upon will enable better operational performance (through greater resident processing capacity) and a lower installation costs. The use of alternative satellite communications and the use of dispersed control centers will enable operating costs to be lowered compared with the solutions currently available on the market. The system will enable greater operational security and planning, as well as the automatic location of vehicles. The main users will be commercial vehicle fleets, military vehicles, ambulances and private vehicles.

19 Development of a System for Measuring the Concentration of Pollutants in the Atmosphere with Infrared Lasers (CO_2 and CO) using Photo-acoustic Spectroscopes

Coordinator:
Edjar Martins Telles

Company:
Unilaser Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 61,005
Phase 2: R$ 181,500

The purpose of this project is to develop a device able to measure on-the-spot concentrations of various molecular types (pollutants) present in the atmosphere with a detection limit of 1 ppb (10-9) or less. This device will use an infrared laser to stimulate the molecules of interest and the detection of the radiation absorbed is done using the photo-acoustic effect. Atmospheric pollution by motor vehicles, factories, slash and burn agriculture, and other sources produces undesirable consequences both for human health and for the environment. The first step in establishing the size of the problem (and its solution) is to determine accurately the concentrations of the different pollutants in the air, as well as their distribution over space and time. To do this, a CO_2 laser will be used initially to develop the spectrometer. A CO laser is of great interest insofar as it can be used to detect various pollutants arising from the combustion of gasoline and diesel oil. The objectives of phase 1 are: a project for a photo-acoustic spectrometer for gases using a CO_2 laser; constructing a photo-acoustic cell for gases to take preliminary measurements for the test; construction of a CO_2 laser operating at 80 lines, between 9 and 11 meters, with power output of 5-10 W. In phase 2, they are: the

construction of a photo-acoustic spectrometer for gases using a CO_2 laser; the development of software to analyze samples, and the development of a CO laser and a market survey.

20 Equipment for Predicting Fungal Diseases in Vegetables

Coordinator:
Nilson Augusto Villa Nova

Company:
Microdesign Informática Tecnologia Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 4,293
Phase 2: R$ 70,938 / US$ 5,584.20

The purpose of this project is to develop equipment for forecasting diseases caused by fungi in vegetables, providing farmers with a technical reference for the use of fungicides and, for scientists, an instrument for improving the algorithms that will form part of the project. The planned equipment will be made up of hardware that collects, records and processes agro-meteorological data in the area of monitored planting and informs, through a display (or also through an optical interface), as to the possibility of fungus infestation and its severity. In recent decades, the advent of new technologies has meant that agriculture has changed a great deal. Maximization of productivity has been achieved mostly by using pesticides. These have caused concern as to their impact on the environment, their increased cost, and the exodus of people from the countryside. The equipment in question must be low-cost, be able to withstand harsh environmental usage conditions and be easy to use and set up. The system will be assembled with degree of protection appropriate for the environment it will be used in and it must be independently battery- and solar-cell- operated. Studies conducted abroad, where the method of predicting diseases has been employed based on agro-meteorological data show a dramatic reduction in the use of fungicides to control and contain the diseases.

21 Enscer – Computerized and Integrated System for Teaching and Assessing Learning and Neural Progress in Mentally Deficient Children

Coordinator:
Armando Freitas da Rocha

Company:
Eina– Estudos em Inteligência Natural e Artificial

Approved value:
Phase 1: R$ 45,000
Phase 2: R$ 131,992

This research project is intended to develop a computerized system for the quantitative analysis of electroencephalograms (EEG), to help in processing and standardizing the medical diagnosis of disabled brains and supplying a set of educational games for supplementing the process of teaching handicapped children. Countless causes contribute to the cerebral injuries that characterize the brains of handicapped children and, in general, more than one neural system (visual, motor, auditory, etc.) is affected in each of these children. This complicates matters in educating them. Quantitative analysis of the EEG has proved efficient in characterizing specific functional deficits and provides reasonable spatial differentiation to justify its use as an important diagnostic tool. Automated quantitative electroencephalographs are feasible nowadays thanks to the use of computers. So-called artificial intelligence is the information technology field that seeks to simulate the intelligent processes undertaken by the brain, but computers have also been used as an auxiliary tool in various educational processes. For these reasons, it is proposed here to develop the Enscer system as a computerized system for quantitative analysis of the EEG made up of the following modules: database; online acquisition module and offline intelligent diagnosis and prognosis module and the educational games module for developing concepts and teaching children to read and write. There is an agreement with the Apae (Association of Parents and Friends of the Mentally Handicapped) in Jundiaí.

22 Technological Development of Micro-environmental Systems for the Rearing, Maintenance and Experimentation of Small Animals in Breeding Units

Coordinator:
Habib Guy Marie Nahas

Company:
Hvac Engenharia e Comércio Ltda.

Approved value:
Phase 1: R$ 49,250
Phase 2: R$ 200,000

The purpose of the project is to study the technical and financial feasibility of producing specific equipment for laboratories of experimental animals in this country, with a view to introducing them. To do this, it is expected to undertake two basic engineering projects, one of them using conventional technology and the other based on this technological innovation. The progress of biomedical research has demanded ever more sophisticated animal models in relation to sanitary control. Obtaining animals sanitarily compatible with the best international standards has required considerable spending on the animal houses, particularly as regards the buildings and equipment. One of the most significant points is the control of the atmosphere of the animal houses, including the control of the temperature and the relative humidity, as well as the proper removal of pollutants, such as ammonia, from the animals' environment. The technology currently employed on this control uses expensive systems and equipment of doubtful efficiency, since most of the time, they consist of adaptations of systems or equipment standardized for use in establishing human comfort levels. Experiments are underway intended to establish specific equipment for animal houses. The preliminary results suggest encouraging results from the standpoint of sanitary standards for the animals, with the possibility of lowering both investment and maintenance costs.

23 Spectrophotometric Workstation

Coordinator:
Lídio Kazuo Takayama

Company:
Femto Indústria e Comércio de Instrumentos Ltda.

Approved value:
Phase 1: R$ 23,960 / US$ 781
Phase 2: R$ 24,741 / US$ 90,000

The purpose of this piece of research is to develop and build a spectrophotometric workstation made up of a spectrophotometer coupled to a three-axis robot for accessing 24 reagents and another also of three axes for choosing one hundred samples, both of them randomly and easily programmable, managed by a standard IBM-compatible PC. Multi-element detection, each using on average three reagents and random access both for the samples and the reagents, are targets to be achieved. The purpose is also to train and qualify new technicians and engineering students to be taken on in the future by the company. The modern chemical industry seeks to automate laboratories, robotics, optimization, simplification, chemo-metric signal processing, easy management results and low cost. From the standpoint of automation, the FIA (Flow Injection Analysis) analysis systems are appropriate when it is wished to conduct an analysis, or several analyses, involving a large number of samples per batch. In industrial chemical laboratories in general, however, there is the need to examine various analyses involving a small number of samples. These samples must be examined immediately. They also require random access and versatility which is not available in current flow systems but which are already present in biochemical automation systems.

24 Instrumental Evaluation of the Quality of Pork and its Uses in the Meat Industry

Coordinator:
Expedito Tadeu Facco Silveira

Company:
Didai Tecnologia Ltda.

Approved value:
Phase 1: R$ 30,805

The quality of pork can be affected by the PSE (pale, soft, exudative meat) or the DFD (dark and firm meat, dry on the surface) conditions. The presence of these anomalies affects the functional properties of the muscle intended for processing, as well as the appearance of the final product. Until the PSE/DFD conditions in pigs are eliminated through

genetic selection, pre-slaughter handling, and the use of good slaughtering methods, there will be an ongoing need to detect, under commercial conditions, the incidence of PSE/DFD in order to use this type of meat properly and help minimize losses in the industry. The present research aims to develop an information technology program to be coupled to the optical system of characterizing pig carcasses. In the first stage, 12,000 animals will take part in the census of the number of pigs slaughtered in four slaughterhouses in the state of São Paulo. Data on the thickness of the bacon and the weight of the carcass will be gathered and 120 carcasses will be dissected to arrive at an equation that will provide the proportion of lean meat representative of the pigs slaughtered in each commercial establishment. The information obtained will also help to develop a swift method of assessing the ability to retain water, intramuscular fat and total pigmentation, and this will be incorporated into the system.

25 Electrocardiograph Linked to a PC with an End Cost of between R$ 500 and R$ 1,000

Coordinator:
Climério dos Santos Vieira

Company:
Elemed Equipamentos Médico-Hospitalares Ltda. – ME

Approved value:
Phase 1: R$ 27,240

It is intended to study the feasibility of building a low-cost electrocardiograph to operate coupled to a PC. The equipment will use the potential of a PC, with the expensive and bulky components of a common electrocardiograph (signal monitor and plotter output) being replaced by the PC's screen and printer. Thus, the intention is to simplify as far as possible the electrocardiograph hardware, keeping its cost to a minimum. The PC will run on Windows, with a window for the operation. A version will also be produced to run under DOS. This electrocardiograph will work together with patient registration software, keeping the result of the examination in the PC itself, along with the patient's record. The equipment will be made up of box with a liquid crystal or a LED display for monitoring its functioning, with the electrodes for connecting to the patient and a power cable with a 127/220 A/C plug and mobile-phone type battery, and another cable for connecting to the PC, which will control its operation. After the examination, the software will perform a statistical pre-diagnosis, comparing the results of the examination with data pre-recorded in memory. It is also intended to use the equipment remotely, through the internet – patients, at home, will conduct their own examinations; the doctor will receive the report in his or her office, over the telephone line, and will then be able to offer guidance to the patient. In future versions, it is intended to include a wireless modem (pager type), to be used with a cardiac monitor in clinics and hospital ICUs.

26 Bragg Grid Characterizers in Optical Fiber

Coordinator:
Sérgio Barcelos

Company:
FiberWork – Optical Communications

Approved value:
Phase 1: R$ 2,620 / US$ 41,200
Phase 2: R$ 31,000 / US$ 79,650

The purpose of this research is to develop a commercial prototype of a high-resolution instrument for characterizing optical fiber devices. It provides measurements of phase dispersal and the delay time in narrow- and broadband optical elements, with particular interest for Bragg grids in optical fibers. The equipment is based on an original interferometric technique, insensitive to polarization, and uses an adjustable, high-resolution, wavelength laser, together with a fully automated system for capturing data. It is able to measure delay time and dispersal with accuracy greater than 0.5 ps and 1 ps/nm, respectively, and with a wavelength resolution of better than 1 nm. There is no commercially available equipment that can take these measurements. Its closest competitor is laboratory-assembled and based on the method of shifting the RF signal phase, which however, costs a great deal to set up and provides less accuracy than the proposed equipment. It is expected that there will be an enormous market potential, because of the growing importance of Bragg grids in fiber optics.

27 Diamond Sanders

Coordinator:
Benjamin Grossman

Company:
Cromática Sistemas de Comunicação de Dados e Informática Ltda.

Approved value:
Phase 1: R$ 40,000

This is a project to develop or adapt machinery for the manufacture of diamond sanders. The procedure chosen was that of adapting a flexography printing machine used in the manufacture of plastic labels for use in liquids containing suspended, abrasive particles in a plastic substrate. Variables to be controlled include the thickness of the layer to be deposited, the adherence of the deposit, the proportions in the makeup of the liquid suspended with abrasives, the speed of drawing the coil so as to enable proper drying of the deposit, and in particular, the choice of the suspended liquid and the quality of the diamond powder, seen through characteristics such as the histogram of the narrow overflow, and the repetition of the characteristics in various batches, etc.

28 Development of the Technology of Molding of Ceramic Items by Injection

Coordinator:
Siegfried Eugen Rayer

Company:
Rayplast Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 34,180

The purpose of this project is to develop injection technology for ceramic items in this country. The use of ceramic techniques is limited, very often, by inherent difficulties in the traditional processes of molding, by the cost of achieving the size tolerances required and the production of complex geometric molds. The process of adaptation of the ceramics by means of injection reduces these limitations substantially, making it possible to use ceramic components in complex shapes, with narrow size tolerances and delicate surface finishing at a cost acceptable to the consumer market. In Brazil, this technique of molding ceramics is not used because nobody has mastered the technology. All the ceramic components with these features are imported.

29 Manufacture of Cast Quartz Products

Coordinator:
Yoshikazo Ernesto Nagai

Company:
Optron Micromecânica Óptica Ltda. – ME

Approved value:
Phase 1: R$ 20,743.20

Cast quartz, because of its thermal, optical, and mechanical properties and its resistance to chemical erosion, is used in various scientific and technological applications, sometimes as a plain structural element in the high-temperature transparent tube, sometimes as the main element in high-performance, telecommunications optical fiber. Mastery of its processing based on the ore is an important target in any scientific and technological policy. This research plan seeks to extend the experiment of fusing quartz from the academic laboratory to the production sector, initially at craftsmen level with production limited by the size of the Brazilian consumer market, which consists of government and a few private research centers. In this initial stage it is intended to transform the Brazilian mined quartz into samples of structural elements and some laboratory objects. To do this, the main item of research equipment, a flame oven of the Verneuil type already manufactured by the company, will undergo modification aimed at increasing the area of deposit to produce larger dowels. The feasibility of producing cast quartz tubes using the same oven will also be researched.

30 Research and Technological Development into the in vitro Transfer of Embryos, and their Sexing and Fertilization

Coordinator:
Jorge Nicolau Neto

Company:
Embrionic

Approved value:
Phase 1: R$ 50,000

The objective of this project is to implement, in this country, two techniques of transferring embryos already employed abroad: Embryo Sexing and *In Vi-*

tro Fertilization. The first enables the sex of the embryo to be identified immediately after being collected from the uterus of the donor. This opens up immense zootechnical possibilities, since, economically, it is rarely worthwhile to raise pedigree males. The breeder, therefore, opts for the insemination or freezing of female embryos. The technique most used around the world consists of puncturing (by micro-manipulation) the seven-day-old embryo, withdrawing a fragment whose DNA code will reveal the sex of the embryo in the laboratory in around an hour (by electrophoresis). The second technique, besides significantly multiplying the female, enables the multiplication of the semen itself, since the eggs collected will be fertilized. With the revolution in genetic engineering, embryo transfer has become universally established since it represents a technique which enables rapid expansion and greater productivity in cattle herds.

31 Biological Markers of Occupational Exposure to Benzene

Coordinator:
Henrique Vicente Della Rosa

Company:
Toxikón Assessoria Toxicológica S/C Ltda.

Approved value:
Phase 1: R$ 32,820

This project, intended to meet the needs of preventative techniques not yet applied in Brazil, is a primary occupational health concern, and is achieved by comparing the efficiency of two biomarkers to assess the degree of low exposure to benzenes in the working environment. The main reason for this choice lies in the fact that workers occupationally exposed and showing a marked degree of metabolizing the benzene t-t-MA run a greater risk of developing leukemia at levels of exposure of more than 1 ppm. In recent times, in Brazil and other countries, a problem affecting workers, companies and the government has become manifest, namely, the serious health risk deriving from occupational exposure to benzene. At the same time, there is evidence of a risk to the population at large because of its dissemination into the environment. The present recommendation of various researchers and institutions for the biological monitoring of occupational exposure to benzene, falls, principally, on biological markers, trans-trans mucoid acid and urinary phenyl mercaptan acid, at low levels of exposure. In the present work Toxikón will seek to develop analytical methodology for determining the trans-trans mucoid acid (t-t-MA) and the urinary phenyl mercaptan acid (S-PMA).

2nd BIDDING INSTRUCTIONS

32 Assisted Cutting of Digital Images and Videos

Coordinator:
Robert Liang Koo

Company:
SDC Engenharia, Sistemas, Eletrônica, Imp. e Exp. Ltda.

Approved value:
Phase 1: R$ 35,000
Phase 2: R$ 57,000 / US$ 35,000

The SDC Company has been developing, through the project Softex, a "tool box" of mathematical morphology for the software of the visual program Matlab. Mathematical morphology is a non-linear technique for handling digital images for image segmentation. This proposal intends to develop cutting tools of the type that can easily be transferred for use in the different programs already in use on the market, such as Photoshop, Matlab itself, 3DStudio, etc. The manipulation of a photograph and of a video demands various sophisticated techniques of image processing. The growing capacity for storage and transmission of current data is possible thanks to technologies such DVD, TV digital, Internet and the various techniques of compressing data (MPEG2 and MPEG4). This ease of access to images and videos is allowing video signals to be manipulated with much more complexity within the digitalized computer. This new panorama opens up routes for diverse applications of image processing where the cutting of the objects is one of the most fundamental operations. The cutting consists in using the computer to define, on the image, automatic cuts, around objects of interest. The intention is to study the best methodology for the development of this software. In particular, during phase 1 of the research we will be looking to understand what are the users' real needs; what sort of interface there should be; whether a stand-alone product needs to be generated or plug-ins for platforms already in existence; and which are the most promising tools.

33 Development of Systems for R2/MF Signaling Using New Signal Processing Techniques

Coordinator:
Carlos Geraldo Kruger

Company:
IDEA! Sistemas Eletrônicos Ltda.

Approved value:
Phase 1: R$ 33,300
Phase 2: R$ 59,900 / US$ 105,000

With this project, the company IDEA! intends to develop an application-specific integrated circuit (Asic) which, besides encompassing the already existing solutions, brings together new functions that justify its application in low cost terminal equipment. For this to happen, it is intended to make use of innovative techniques of telephone signal processing jointly with the use of structured project methodologies, where a high level description is made with the later use of simulation tools and synthesis. Having detected the growing strength of small and medium enterprises throughout the world, a research group, originating from the Telebrás system, decided to create the company IDEA! Sistemas Eletrônicos Ltda. Determined to meet and to exceed their customers' expectations, IDEA! visited the companies that are important players in the Brazilian technology arena and identified the interest of businesses in the telecommunications sector in the development of a low cost Asic component for the reception and transmission of multi-frequency signals of type MFC and MFP. As a result, it expects to obtain a low cost component for MFC that will enable the development of national equipment for various applications, rendering them competitive in the national and international markets.

34 Development of an Intra Surgical Topograph (first prototype)

Coordinator:
Silvio Antonio Tonissi Junior

Company:
Eyetec Equipamentos Oftálmicos Ind. e Com. Ltda.

Approved value:
Phase 1: R$ 33,100 / US$ 11,738
Phase 2: R$ 182,223 / US$ 30,950
Scholarships: R$ 31,500

The objective of this project is to carry out of practical research in the area of cornea topography and the development of the first prototype for intra surgical topography (for use during the surgery), an instrument unprecedented on the national or international market. As a first step, a system for the projection of cornea rings must be developed, which will perform well during surgery. Its light must not be obscured by the illumination of the surgical microscope and the reflection on the cornea must be sharp. The projector should be built in the form of three acrylic cones. Once assembled, it will be coupled to a fiber optic illumination system with light source intensity that can be regulated. It is intended to produce the system in two versions: one for a notebook, and the other for a desktop, both computers to be IBM-PC compatible. The first will have the advantage of being portable; the second will be able to use image capturing video boards specific to a desktop, which enable capture of better quality images and in real time. The digitalized images will be processed for the detection of rings reflected by the cornea. Algorithms of mathematical models of topography of the human cornea will be applied to the information obtained. Topographical maps, with color codes for different curvatures, will be generated and available in intervals of a few seconds during the surgery, thus assisting the surgeon in the diagnosis of surface irregularities. Cataract and refractive surgeries in general, are examples for the use of this system.

35 Development of an Endoscope Video Camera with an Optical Gradient

Coordinator:
Cícero Lívio Omegna de Souza Filho

Company:
Kom Montagens e Comércio Ltda.

Approved value:
Phase 1: R$ 53,387
Phase 2: R$ 113,900 / US$ 79,500

The present project proposes the development of an endoscope optimized for use as a video camera. The endoscope is an optical instrument that allows for the observation of locations with limited access. The instrument is composed of a metallic rod and in its interior are housed the image optics and a bundle of optical fibers for illumination. Its diameter varies from 1.8 to 12 mm. The endoscope that we propose to develop will be of the rigid type and we will make

use of technology of graduated lenses (grin lenses). These lenses have a cylindrical form and possess a profile of refractive index that diminishes gradually from the axis to the cylinder. The use of the technology of grin lenses, as against conventional lenses, allows: the use of less lenses, as a consequence less loss through reflection and accumulated aberrations; greater precision in the positioning of the lenses preserving the optical axis of the system, since they possess cylindrical symmetry; and a smaller tube diameter, making the inspection of the cavity less invasive. Currently the video endoscope requires an additional optical system to link the image of the endoscope to the CCD camera. Considering the illumination side, the fiber optic cable is interrupted by a connector placed between the source and the endoscope, and this connection causes a loss in the order of 50 per cent. In the first phase of this project, we built four prototypes, three of them possessing optical gradient and one a microvideo-otoscope using conventional lenses. Innumerable gadgets and mechanical tools were made to assemble and test the produced instruments. Efforts in the mounting and development of a new light source integrated with the control unit of a micro camera were experimented with. A special type of fiber was designed and made up with a diameter of 40 microns. Using this fiber, beams for the illumination of the prototypes were constructed.

36 Chemical Metrology Laboratory

Coordinator:
Nilton Pereira Alves

Company:
QuimLab – Química e Metrologia (Sesoko & Alves Ltda.)

Approved value:
Phase 1: R$ 15,500 / US$ 28,500
Phase 2: R$ 56,216 / US$ 121,378

The objective of this project is to establish a chemical metrology laboratory aimed, mainly, to cater for industrial companies regarding the supply of internationally recognized chemical standards for the main analytical techniques used in the chemical control of products, processes and the environment. For each standard produced a trace certificate will be issued, recording the real value of the determined chemical purity with respect to impurities. The traced standards will be commercialized and will fill the gap in this area in Brazil, principally by fulfilling industry demands with respect to international quality norms such as ISO 9000, ISO 14000, QS 9000 and others. The laboratory will limit itself to producing standards of pH, ionic activity, conductance, elements for absorption and atomic emission, organic compounds for GG, wave length and transmittance for spectroscopy of UV, visible and infrared light, and primary standards for volumetric analysis. It is important to emphasize that this project should involve research which could be utilized in other laboratories of the same type and also by official bodies such as the Inmetro, which is attempting to implant bases of chemical metrology in Brazil, mainly for the manufacture of its own standard reference materials and the formation of a network of chemical metrology accredited and recognized internationally, along the lines of those already in existence in the Brazilian calibration network (RBC), adopted for the laboratories of physics and mechanics metrology.

37 Evaluation of the Residual Water Treatment System from Cassava Processing

Coordinator:
Marney Pascoli Cereda

Company:
Plaza – Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 48,511.70

The present study is part of a project for the management of residues from the industrialized cassava process, set up by the PRI program jointly by the Brazilian Ministry of Science and Technology and the French Ministry of Foreign Relations (R$ 29,000.00 were provided for its development). However, according to the program regulations, those funds could not be used for the purchase of equipment, which rendered the development of the project impossible. An alternative found was through FAPESP's Program for Technological Innovation in Small Businesses, as a means of complementing the resources.

38 Stereotrips II: Stereoscopic Computer Graphic Techniques and Synchronized Audio-Video for Multimedia Applications

Coordinator:
Nelson Coelho Nascimento

Company:
Intuição S/C Ltda.

Approved value:
Phase 1: R$ 39,300

The present research project has as its objective new research technologies for the presentation of high resolution computerized animations accompanied by music, with a view to launching the product, which should result from this work, on the international market, in particular the United States. Since we are dealing with animations generated through 3-dimensional models, the main emphasis is being made on the study of emergent technologies in the field of real time rendering, such as Direct X®, OpenGL®, and, as well, in the language of VRML 2.0. The research project Stereotrips II is a continuation of the project Stereotrips, carried out in 1996, which consisted of a CD-ROM with stereoscopic animations accompanied by music. Ten stereoscopic animations were made, each with its respective musical accompaniment, run on a piece of software especially created for this purpose, on the PC-Windows platform in 16 bits programmed in Visual-Basic language. This CD could also be played on conventional audio CD players. The software in this case used DLL routines freely distributed and created by the Autodesk company. The basic feature of Stereotrips is simply the stereoscopy of the animations, which provides the illusion of 3-dimensionalism on two-dimension support without the need for glasses or any other device, requiring nothing more than the common multimedia computer.

39 DNA Automatic Sequencing in Molecular Diagnostics: Analysis of the Efficiency, Reproducibility and Costs of Different Methods

Coordinator:
Heloísa Barbosa Pena

Company:
Genomic Engenharia Molecular Ltda.

Approved value:
Phase 1: R$ 47,600

The Genomic Engenharia Molecular company specializes in the development and commercialization of diagnostic tests in medical, veterinary and agricultural areas using molecular biology techniques. During the process of setting up diagnostic tests based on the automatic sequencing of DNA, the company encountered a large number of viable alternative techniques and a total lack of data which would allow the comparison of the methods regarding quality, reproducibility, cost and the possibility of automation. This project aims to overcome this difficulty by means of a comparative analysis of the different techniques currently available in the academic world, but as yet not widely used in the industrial environment. This project, during its first phase, will provide comparative data on the cost and the benefits of these methods based not on theoretical studies, but on practical use.

40 Technological Innovation for the Financial World

Coordinator:
Mamede Augusto Machado da Silveira

Company:
JRM Informática Ltda.

Approved value:
Phase 1: R$ 50,264

The objective of this project is to study the technical viability of a computerized structure capable of meeting all the storage and processing requirements of the corporate information of a financial institution, in a single, integrated form. Furthermore, this structure should serve as an embryonic tool for undertaking the re-engineering of the institution's business processes. The requirements for the success of a company's strategic plan are effected only if the systems that support their businesses are able to make fast changes, with real-time access. Consequently, it is necessary to re-think information technology solutions in such a way as to converge and support all of the business processes (flexible and adaptable) and the information technology needs of the company. For this to occur, a model of an integrated system must be built, with the following prerequisites: integration in a single system of all of the institution's data and business processes; total portability between various client/server platforms; easy scalability of applications between few or many users; inter-operability between the diverse open standards of the information technology market; the possibility for the extension of the model for the inclusion of new types of complex data and new products; offers the possibility of gradual migration from the institution's existing systems; minimizes costs; offers a user friendly graphic interface capable of manipulating and bringing on screen com-

plex data; establishes a technology plan for the financial institution for the next decade.

41 Metropolitan Wireless Network – Wireless MAN

Coordinator:
Oséas Valente de Avilez Filho

Company:
Josaphat Engenharia Ltda.

Approved value:
Phase 1: R$ 39,111.11

Our proposal is to present an alternative to the rationalization of water consumption and electrical energy, that consists in the development of a system the objective of which is to better distribute the consumption of these resources throughout the day. As is known, there are consumption peaks that define the capacity of distribution networks. If consumption were better distributed, the peaks would be reduced and as a result, existing networks could be re-dimensioned and maximized, there no longer being the need for large investments in new networks, generating in this manner, a huge benefit to environmental conservation. Brazil has an enormous potential of natural resources. Despite this, serious problems related to shortages of fresh water and electrical energy, have begun to appear. With the online monitoring forecast in this project, other gains will be obtained: a reduction in physical losses (leaks, diversions, etc.) and non-physical losses (billing evasion) and the detection of critical situations, making possible prompt corrective action in the distribution systems. Currently, the Brazilian market has no available system capable of monitoring the supply networks. Our initial goal is to meet the needs of this market, and in the future, to export the technology and the developed products to other countries. The Metropolitan Area Network (MAN), the main objective of this project, will be a low velocity, wireless network using Spread Spectrum techniques and code division multiple access (CDMA).

42 Low Noise Amplifier with Frequency Converter in KU Band (LNB – Low Noise Block) for Use with Parabolic Reflectors

Coordinator:
Alexandre Nunes da Trindade

Company:
Proqualit Montagem e Comércio Ltda.

Approved value:
Phase 1: R$ 19,900 / US$ 7,206.40
Phase 2: R$ 155,800 / US$ 20,000

The present project consists of the complete specification of a low noise level amplifier with frequency converters in KU Band (satellite television) Low Noise Block (LNB) for the features currently used on the national market by the operating companies of the DTH (Direct to Home) system: Sky (Globo Group) and TVA (Abril Group). Thereafter, a theoretical project should be developed that will attempt to solve the problem of the balance between the specified impedance for the minimum noise level and maximum gain in high frequency (12 GHz) and for the variations in the environment temperature (-10°C to 50°C). Once the theoretical electrical project is defined, in accordance with the diagram of the blocks to follow, a mechanical project enclosing the box and attaching the reflector should be carried out. Diagram of blocks of LNB: Zin 1 = Zin 2; Zout 1 = Zout 2; O.L. = Local Oscillator, and LNA = Low Noise Level Amplifier. The next step will be the mounting of the components, thus obtaining the first prototype of this printed circuit plate made in the country. Shortly afterwards, tests must be carried out on the performance of the mounted PCP (Printed Circuit Plate). After the evaluation of the performance, possible modifications to the PCP will be made, which must be integrated with the container box and the reflector for new performance tests. The final evaluation must be carried out on the whole assembly: parabolic reflector + LNB + receptor. The conclusions to this project should indicate the best solution for the mass production of this product. This study could also generate important procedures for projects on frequency converters to be applied in other telecommunications systems.

43 Inertial Sensors Integrated Platform/ Global Positioning System (GPS)

Coordinator:
Otávio Santos Cupertino Durão

Company:
Navcon Navegação e Controle Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 23,635 / US$ 21,929
Phase 2: R$ 111,739 / US$ 45,564

This research project is looking to integrate, on a single platform, inertia sensors and a low cost GPS receptor, with the aim of determining trajectories and position. Besides the mechanical integration, algorithms, processing and the treatment of the necessary signals will also be implemented. As a result, we expect to have, on a small-dimensioned, low mass platform, a unit capable of offering better results than those of its components (GPS and inertia sensors) when working in isolation but with same purpose. In addition, the integrated platform will overcome the limitations these components have when acting in isolation. Continuous use of isolated GPS receptors, for example, is not possible, due to temporary geometric restrictions of its positioning. Other causes of temporary loss of GPS signal occur due to errors in signal transmission. Also, the frequency of the GPS receptor reader is insufficient in certain cases, and this frequency will be substantially increased when it is integrated with the inertia sensors. The integration of these two pieces of equipment eliminates these deficiencies. Phase 1 of the project analyzed the viability of this integration for a wide range of applications. As a result, in phase 2, the intention is to build a pre-industrial model of the system that has modular characteristics. That is, attention will be paid to different applications and precision specifications, allowing for the modular substitution of some of the system's components, notably the inertia sensors board. In this way, low precision applications can be handled with low cost sensors, without this preventing the use of the system in other higher precision applications, provided better quality sensors are used.

44 Development of Plasma Processes Applied to Metallurgy

Coordinator:
Vladimir Henrique Baggio Scheid

Company:
Metal Plasma S/C Ltda.

Approved value:
Phase 1: R$ 49,000

The objective of this project is the development of the following processes of plasma application in metallurgy: plasma nitration of non-ferrous elements, deposition of films of Al2O3, TiN and TiC by using a structure of hollow cathode discharges and superficial treatment of ferrous elements in substitution of the conventional galvanization processes. These processes were chosen due to the fact that they require few modifications to the existing processing unit, as well as their high content of technological innovation and their large commercial potential, given that they are part of a virtually untapped niche market in Brazil. Though there is equipment (from foreign companies) available on the market, Metal Plasma chose to develop its own reactor, since advanced technologies require constant changes and adaptations. The first processing unit consists of a high vacuum stainless steel chamber with a useful volume of 120 liters, a Roots Pumping System with a flow rate of 150 m3/h, a 30 kW electrical source and an admission system for Ar, N_2 and H_2 gases. Taking the project forward, phase 2 will entail applied research studies in order to develop the selected processes, in order to reach the quality standards that will allow its use on a commercial scale. Basically four experimental techniques will be used in the investigation of the plasma: atomic emission spectroscopy, atomic absorption spectroscopy, mass spectrometry and current flow.

45 Development of a Plasma Sterilizer

Coordinator:
Tadashi Shiosawa

Company:
Valitech Ind. e Com. Ltda.

Approved value:
Phase 1: R$ 36,600
Phase 2: R$ 111,290 / US$ 18,494.75

This project entails the development of a sterilizer for contaminated surgical, odontological and packaging materials, through the use of plasma technology. The development will be done in stages. In the first stage, market research will be carried out, looking at the technical viability and marketability of the process to be developed. In this phase contacts and visits will be undertaken to companies and institutions that use surgical, odontological and packaging materials in general which need to be sterilized before use, aiming to obtain information about these materials such as their physical and clinical properties and the level of sterilization necessary. Parallel to this, a prototype sterilizer will be built, where the conditions of the plasma discharge of some gases

will be investigated. Once the parameters for the luminescent discharge (plasma) have been defined, and taking into account the results of the market research, a sterilizer will be built in which tests on the elimination of standard bacteria will be carried out as well as studies of the effect of the plasma on the sterilized material itself and the determination of the best conditions for luminescent discharge sterilization. From the results of this research project, our ultimate goal will be to manufacture a plasma sterilizer that meets the needs of the market.

46 Development of Modular and Configurable Equipment for the Capture and Digital Processing of Biological Signals

Coordinator:
Luiz Antônio Barbosa Coelho

Company:
Lynx Tecnologia Eletrônica Ltda.

Approved value:
Phase 1: R$ 49,800

The project intends to specify and to develop a system of capturing and processing biomedical signals based on modular hardware and totally configurable software that offers both high performance and a high degree of flexibility. This system will be based on modules of simple and standardized hardware and from groupings of which a high processing capacity in numbers of channels and a high degree of sampling can be obtained. Particular emphasis will be given to the configurability of this system, allowing for its use across a wide range of applications, as well as its easy adaptation to other types of application, even outside of the biological area. Consequently, the short term goal is: to specify the design of the distributed system of capturing and processing (biological) signals capable of processing up to 64 channels, with a sample frequency of 20 kHz per channel with presentation and digital filtration of the signal in real time under the control of a microcomputer, and to define a high performance communication protocol between the microcomputer and the acquisition modules and the digital processing of signals, and to formulate processing algorithms in real time for application in neurophysiology. In the long term, the intention is to consolidate technological training within the project as well as the implementation of capturing and digital processing systems of high performance signals.

47 Development of Semiconductor Laser Equipment for Medical Applications

Coordinator:
Sergio Celaschi

Company:
Ecco – Fibras e Dispositivos

Approved value:
Phase 1: R$ 45,500

The objective of this research is the design, development and surgical testing of prototypes of three portable pieces of equipment for laser operations, each one of them consisting of a diode laser semiconductor with a radiation source. Cables and optical probes for specific applications will be optically linked to the main parts of the prototypes. In addition, a visible optical sight will be located on the same optical exit cable. The first clinical tests of the prototypes are forecast for ophthalmological, dermatological and acupuncture operations. The main application for the three categories of equipment are: low power (between 50 and 200 MW) – for bio-stimulation, with analgesic, anti-inflammatory, anti-spasmodic and vasodilatory effects; medium power (between 1 and 3 W) – for ophthalmological and dermatological treatments, and high power (between 15 and 20 W) – for general surgery. The methodology of the study envisages handing over the prototypes to university hospitals for clinical and medical testing. We expect to demonstrate the viability of designing and assembling three portable medical prototypes for laser surgeries. Two of them will be designed and mounted for operations at 810 nm, and one of them (an innovation) will emit close to 0.5 W of power at 405 nm. This wave length will be obtained by doubling the efficiency of its primary frequency. The main applications are expected to be in bio-stimulations, with analgesic, anti inflammatory, anti-spasmodic and vasodilatory effects, for ophthalmological and dermatological treatments as well as general surgery.

48 Transportable Odontological Module

Coordinator:
Alexandre de Oliveira Rangel

Company:
Oral Health – Oliveira Rangel & Camargo Jr. Ltda.

Approved value:
Phase 1: R$ 19,007

The objective of this project is to develop a mobile odontological module, fitted with simplified equipment, easily carried from one location to another, so as to offer odontological services directly to the more needy areas. Today, mobile dental health teams are already a reality and have been established in various Brazilian municipalities based fundamentally on Clinical Modular Transportable Systems. These teams move about in order to assist priority population groups. For example, they visit primary and secondary schools within the municipality on a rotating basis, providing an initial service for first grade primary children and yearly checkups on students in the other school grades. Today, with their accumulated experience, in addition to teams dedicated to the care of children and adolescents, one can imagine mobile teams, working through a transportable clinical module system, meeting the needs of special groups such as the elderly, pregnant women, factory workers etc.

49 Development of a Generic Planning Solution of Automatic Processing for Parametric Parts

Coordinator:
Haroldo Thomaz Kerry Junior

Company:
KSR Com. de Materiais e Componentes para Informática e Consultoria Ltda.

Approved value:
Phase 1: R$ 15,561
Phase 2: R$ 66,241

The goal of the present research work is to enable the Cappe (Computer Aided Process Planning Environment) information technology system already developed by KSR, to become an automatic system for parametric parts in general. KSR is a partnership of former University of São Paulo (USP/São Carlos) students who, five years ago, with experience gained in the area of Capp (Computer Aided Process Planning), set up the company with a view to filling a gap they detected in the international industrial automation market. Shortly afterwards they launched the Cappe system. However, this system does not support automatic generative planning, and this represents a serious limitation. An automatic solution for parameterized parts was developed, with good results, in a master's thesis. However, this development was too specific and it was not possible to incorporate this feature in the Cappe solution – something the present work is attempting to remedy. The results of phase 1 demonstrated the technical viability of the proposed solutions. The objective of phase 2 is to complete the implementation of a prototype resulting from phase 1, with emphasis on the details of the integrated process of CAD, multi-language working, integration with ERP, three layer design and visualization of the plans via the web.

50 Application of Conductor Polymers as Gas Sensors

Coordinator:
Milton Soares de Campos

Company:
Toró e Toró Ltda. – ME

Approved value:
Phase 1: R$ 49,500

The objective of this project is to use the rectification properties of conductor polymers for the construction of sensors for methane and ethylene gas. For this, two types of polymer will be used, which are very stable under environmental conditions, polypyrrole and polythiophene. Schottky diodes will be constructed using these polymers (doped with protonic acid), both in the planar configuration (with two metallic electrodes deposited by lithograph or silk screen on the same face of the polymer) and in the sandwich configuration. Metals with a work function that forms ohmic and blocking contacts with the polymer will be used. Studies of the electric current as a function of the DC voltage, both in the forward direction and reverse, in relation to humidity, temperature and gas concentration, will be carried out using doped and non-doped polymers. Their sensibility, reproducibility and stability will also be investigated. We expect to collect sufficient information for the construction of a sensor for ethylene and methane gas. Despite the agricultural sector being one of the most dynamic in the national economy, one of the serious problems still is the storage of agricultural produce. It is estimated that close to 25 per cent of the total production is lost yearly through decomposition and fires that occur in grain silos, probably caused by the formation of inflammable gases such as methane. In the case of the controlled stocks of fruit, their maturing is caused by the formation of a hormone which on decomposing forms the gas named ethylene.

51 Development of Devices in CVD-diamond for Short Term Applications

Coordinator:
Kiyoe Umeda

Company:
Clorovale Indústria e Comércio de Cloro Ltda.

Approved value:
Phase 1: R$ 26,335.50
Phase 2: R$ 109,000 / US$ 76,485

The objective of this project is to carry forward the research and development work of the National Space Research Institute – Inpe and of the São Francisco University – USF, in a small company, with the real possibilities of achieving the industrialization of products manufactured from CVD-diamond. This artificial diamond has properties equivalent to natural diamond, with the advantage of being made available in the form of fine and thick films on small surfaces (less than 1 mm2) and large surfaces (greater than 100 cm2), in different formats. The company itself already produces hydrogen gas, the most expensive raw material for the process of growing CVD-diamond. Within this objective, there is the need for the assembling of a reactor for growing, on large surfaces, with a system of recycling/reusing of the gas adjusting the reactor to higher growth rates, appropriate to industrialization. To be able to make use of the company's hydrogen, it will be necessary to set up a compression system for this gas, allowing its escape into the appropriate receiving vessel. With this new reactor concept, there is a need to research, on an industrial scale, the new growth parameters in relation to quality, rates of nucleus and film growths to be produced on some types of substrates. At the heart of this research, there is a desire to develop and place on the market, devices such as mechanical probes, cutting edges for plastic materials and non-ferrous metals, orifices and tubes in CVD-diamond, drills for odontology and related uses, as well as windows for optical protection.

52 Manufacture of Credit Cards, Open and Closed Plastic Cards

Coordinators:
Wellington Gomes de Andrade / Amador Poceiro Orelo

Company:
Tecnocard Tecnologia em Cartões Ltda.

Approved value:
Phase 1: R$ 48,000
Phase 2: R$ 199,800

Phase 1 of this research project aims to build a collection of totally original prototypes for the manufacture of plastic, magnetic, inductive, smart cards and transponders entirely from national components, that offer ease of operation and maintenance, high productivity, and considerably lower cost compared to the technology available on the international market, in addition to levels of quality and security compatible with international standards, to be used in information technology systems. In phase 2, we will aim to reach the stage of manufacturing of magnetic credit cards and smart cards on an industrial scale. The innovation for the second phase, will be a system of authentication and security for transactions through public networks (Internet/fax/telephone), named Security Smart Card. The aim of this product is to offer to companies the ability to expand, securely, via computer networks. These products will have three main elements: software with the authentication of an electronic signature and dynamic passwords generated by a cryptographic key, a smart card reader connected to personal computers and personalized smart cards manufactured by the company, with the innovation of combining smart card and inductive card technologies. We will be dealing with an inductive relay with metallic printing, with mechanisms for insertion of tracks and safeguards within the internal part of the card.

3rd BIDDING INSTRUCTIONS

53 Technological Modernization of Optical Amplifiers by Erbium Doped Fiber

Coordinator:
Ildefonso Félix de Faria Junior

Company:
AGC – Optosystemas Ltda.

Approved value:
Phase 1: R$ 8,300 / US$ 37,000
Phase 2: R$ 74,600 / US$ 106,460

The objective of this project is the improvement of the technology of Optical Amplifiers by Fiber Doping with Erbium (AFDE), as well as the establis-

hment of a laboratory, dedicated to the product. AFDEs are pieces of equipment for the amplification of optical signals transmitted via optical fibers, fed by a source that is also optical (semiconductor laser, high powered optical electronic devices). We are dealing with a technology initially developed by the Center for Research and Development of Telecommunications (CPqD/Telebrás) and that has undergone technological modernization over the last six months. The fundamental changes in the initial project were the design of an electronic control system based on micro-processing circuits and the construction of a measuring device that allows the monitoring of the internal parameters of the amplifiers, as well as the current and temperature of the base laser; optical potential at the entrance and exit of the amplifier; RS232 interface for interlinking with the supervision and management systems of telephone exchanges. For the second phase, the development will be taken forward, concentrating attention on the module of optical gain. Special filters will be used so as to equalize the optical gain in the operational band which, in addition to producing a planar gain, will allow a small broadening of the amplifier's optical band. Special optical fibers will be used and also a rounding design to produce amplifiers in the optical band of 1570 to 1610 nm, band L).

54 Studies of Acidification of Raffinate in Kuhni column, to Increase the Yield in the Phosphoric Acid Purification Process

Coordinator:
Roberto Corrêa de Cerqueira César

Company:
Fosbrasil S/A

Approved value:
Phase 1: R$ 46,000

The objective of this process is to increase the efficiency of the liquid-liquid extraction in flux process for the purification of phosphoric acid, which has been successfully used for the last 13 years by Fosbrasil, which is the only Brazilian company to have mastered this cutting edge technology, possessing in its premises a pilot plant where it has already carried out various tests with raw materials, improving and implementing changes in the purification process. The purification process, via extraction, is divided into three stages: extraction, cleaning and re-extraction. In the first stage, the extraction of the acid H_3PO_4 occurs to the degree of that used as a fertilizer (aqueous phase) with a cooled solution of isopropyl ether/ tri-butyl phosphate (organic phase). The residue produced from this phase is called raffinate, which is rich in compounds of phosphate not available for extraction, generally metallic phosphates of Mg_2+, Fe_3+ and Al_3+, deriving from the phosphate mineral. The process is now looking to improve on the extraction process operations of the pilot plant with a reactor and a Kuhni column, where the acidification using sulfuric acid from the raffinate occurs, followed by extraction with the solvent of phosphoric acid. The acidification with the stronger acid frees the phosphates in the raffinate, increasing the yield of the process. In the extraction process, the phosphates must present themselves in the form H_3PO_4 in order for the transfer from the aqueous phase to the organic solvent phase to occur. With increased efficiency in the process, it will be possible to reduce the cost of the final product.

55 Optimization and Classification Project on Biodegradable Polyurethane Foam

Coordinator:
Eduardo Murgel Ferraz Kehl

Company:
Eduardo Murgel Ferraz Kehl – ME

Approved value:
Phase 1: R$ 39,965

The objectives of this project are to improve the physical-chemical properties of the product BioEspuma (BioFoam), its parameters of production, to determine the quality system, to analyze its behavior regarding properties of biodegradation and as a substrate for the growth of plant cuttings. Once the parameters are defined, the intention is to produce and sell the possible products obtained, such as packaging, and the intermediate raw material (polyol) targeting a profit margin greater than 20 per cent. The company's philosophy has always been to give priority to using processes, the raw materials of which can be obtained from the agriculture/farming industry, which aim towards products of large consumption. From castor oil and other derivatives of the agriculture/farming industry a semi-rigid foam (basically of polyurethane) has already been obtained, which is biodegradable. The product was patented as BioEspuma. The objective now is to work out the details of a production process and a quality control system which meet the ISO 9000 and ISO

14000 standards. In five years, it is intended to produce a quantity equivalent to 2 per cent of the current consumption of packaging material. Presently, this would be around 300 tons/month or US$ 1.5 million of monthly income. Another objective is to triple market share during a second five-year period of the project, generating, in this manner, sufficient resources for investment in the area of production technology. The objective is to use the family workforce of small producers for whom the cultivation of the castor bean on a consortium basis would provide an alternative to traditional crops. The tests on cutting growths will be in the form of observing and recording growth from the seeds.

56 Development of Coatings Intended for the Use of Organic Corrosion Inhibitors and to a Reduction in the Use of Solvents

Coordinator:
Lorenzo De Micheli

Company:
Reade Revestimentos Especiais de Alto Desempenho Ltda.

Approved value:
Phase 1: R$ 7,500

This project proposes a reduction in the use of solvents in coatings through the use of a thermo-fixing resin (epoxy resin) with a high level of solids and the use of non-toxic organic inhibitors in place of the conventional organic compounds. Research and development in the area of coatings in Brazil is very small. Even today, industrial companies are using very old formulae that work, but which ignore environmental issues. With increased demand from Brazilian society for the manufacture of products which do not damage the environment, it is now becoming necessary to research coatings which are longer lasting and have a lower level of solvents in their composition. Current coatings on the market normally contain toxic inorganic inhibitors based on lead or zinc.

57 Technological Innovation in the Recycling of Plastic Bottles from Gas Stations

Coordinator:
João Antonio Galbiatti

Company:
Comércio de Ferro Velho Moretti Ltda.

Approved value:
Phase 1: R$ 27,546

The present project's objective is to study and develop processes for the recovery and recycling of lubrication oils, additives and high density polyethylene (HPDE) originating from leftover bottles at gas stations. In addition, a further objective is to develop systems for the capture of this raw material with a view, ultimately, to developing a viable program for the return to a useful life of these residual pollutants. Therefore the studies involve: the verification of the procedures most appropriate for the capture of throw-away bottles; the verification of the frequency necessary for the removal of collected residues; studies of the processes of decontamination of the HPDE bottles, with the removal of the residual oil and of foreign material (tops, seals, paper); improvement in the HPDE recycling process; improvement in the recycled granules (HPDE) production process, as well as the production of plastic bottles from granules of recycled HPDE. Brazil consumes per year close to 900 million liters of lubricant oil, of which 60 per cent is for automobile oils and 40 per cent for industry. During its use, part of the lubricant is burned or incorporated into the final product, leaving somewhere between 250 and 300 million liters of waste oil per year. Only around 100 million of liters of this oil per year go to refining. The remainder is discarded into the ground or into water or burned, almost always in an inadequate manner (one liter of oil is capable of removing the oxygen from 1 million liters of water). Gas stations discard into the environment HPDE bottles contaminated with lubricant oil and additives. Since its biodegradable rate is extremely low (over one hundred years) these bottles reduce the useful life of rubbish dumps and landfills.

58 Development of a Self-Propelled Sprayer/Duster for Treatment in Citrus Orchards

Coordinator:
Tomomassa Matuo

Company:
Herbicat Ltda.

Approved value:
Phase 1: R$ 36,700

The present proposal intends to develop a self-propelled duster for the treatment of citrus orchards entirely mounted on a modified tractor, with the ob-

jective of obtaining greater efficiency in the work and in the treatment, of gaining better maneuverability, greater height – in order to have more favorable angles for covering the high parts of the plant –, to diminish losses during the application and to improve the security and comfort of the operator. An important objective is to minimize losses, leading to reduced production costs, less environmental contamination and greater safety for the operator. The intended sanitization treatment of citrus trees is one of the main production cost components, accounting for more than a third of the overall cost. The use of the plant-sanitization products applied to the crown of the tree (insecticides + acarus killers + fungicides), during the year 1996, absorbed close to US$ 120 million. In spite of the intensive use of sanitization products, the operation of phytosanitary treatment is characteristically extremely wasteful. Losses during the application by mechanized process using turbo atomizers, which is the principal process, are in excess of 63 per cent. In 1988, we presented a model of an applicator that made use of various basic components through the use of which the loss was reduced to 24 per cent. This invention won an award at the XV National Convention of Brazilian Inventions, receiving the "Governor of the State of São Paulo" Award.

59 Estocastic Analysis of the Temporal Dynamics of Cardiac Arrhythmias through Intermittent Recording of an Electrocardiogram, for Very Long Time Periods

Coordinator:
Ricardo Geretto Kortas

Company:
Kiim – Kortas Informática Instrumentação Médica Ind. Com. Imp. Exp. Ltda.

Approved value:
Phase 1: R$ 30,200
Phase 2: R$ 183,900

Phase 1 of the project aimed to analyze intermittently recorded electrocardiograms (ECG), over a long period of time, in order to obtain a better understanding of the spontaneous variability of the cardiac arrhythmias, with consequent improvements in the estimation of the risk of arrhythmias and in the use of anti-arrhythmia drugs. Subsequently, since this phase enabled the development and implementation of the basic parts of a complete collection system, transmission and analysis of the biological parameters such as electrocardiogram (ECG) and blood pressure (BP), the emphasis changed towards a philosophy of horizontal development where the system is put into a working situation with all of its parts available, and progressively amplified. What remained for the final part of the 2nd phase was the stochastic analysis of the parameters collected over long periods of time. In Brazil, sudden death from cardiac arrhythmia ("cardiac arrest") is the greatest cause of death in the adult population. The introduction of the Holter exam, in which 24 hours of ECG are continuously recorded in the normal environment of the patient, represented an advance. Nevertheless, a significant part of the ECG information is not utilized. This arises from the failure to analyze day-to-day variations. The proposal is to use the support technology already developed by the company namely digital Holter recorders and software, to analyze the arrhythmias on the ECG, to create a teleprocessing center that will allow ECG monitoring over extended periods of time (more than two weeks), and to improve and test previously studied models of dynamic analysis.

60 Applications of Cooperative and Communication Work for Educational Institutions

Coordinator:
Rodrigo Cascão Araújo

Company:
RAM Computer Systems – Consultoria em Informática S/C Ltda.

Approved value:
Phase 1: R$ 33,000

This project's objective is the implementation of a computerized system for applications in cooperative and communications work specific to educational institutions via the Internet. The top priority of this system is to offer these institutions an alternative that overcomes existing obstacles. The system must be simple, efficient, functional, comprehensive, and easy to administer and operate. With the ever-expanding use of the Internet, the worldwide computer network, educational institutions have increasingly begun to exploit its potential for accessing and publishing information, cooperative work and communication. However, there still are three obstacles that create difficulty or impede this use: the diversity of standards and the absence of a single operating

environment; the demands for a broad body of technical knowledge for use with these existing environments; and lack of mechanisms that promote the participation of parents, teachers, pupils, and members of other institutions in the single collaborative context. The proposed system would be structured in a manner so as to simulate the working of a traditional school. All of the modules should be accessible via an initial common interface: the web browser. It would need to allow the publication of documents independent of platform and the format in which they are created. Its users should be able to make use of it from any part of the world via the Internet. It should allow the exchange of information between various institutions and the publication of internal activities of the institution for public access.

61 Development of Systems for Localized and Rationalized Application of the Technology of Herbicide Application for Railroads

Coordinators:
Ulisses Rocha Antuniassi / José Armando Furlani Junior

Company:
Infrajato Engenharia Ltda.

Approved value:
Phase 1: R$ 36,319 / US$ 8,527.50
Phase 2: R$ 52,600 / US$ 31,026

This research project aims to develop and evaluate new techniques and equipment for the application of herbicides. It is intended to bring together advanced technologies relating to the selection of snouts, construction of duster bars, electronic management and localized application. In addition, the project seeks to train the proposing company's personnel in order to offer services in the control of nuisance plants on railroads and the development and employment of concepts of localized application of agricultural herbicides in general. In this second phase, we propose to build a piece of equipment for the localized application of herbicides and the implementation of an improved control system of nuisance plants on railroads, following the concepts of precision agriculture. The system will be based on an on-board computer to be installed in the cabin of the applying equipment, which will consider three main questions: the generation of the target maps for application, the navigation system and the work controller. Mapping of the targets will be carried out by means of prior passage of the equipment over the areas of application, at which time the operators will collect information about the targets, using special keyboards. The navigation software will receive the signals from the DGPS (Differential Global Positioning System) and from radar (positioned with reference to the ground), providing information of position and time, which will enable the generation and reading of the geo-referenced maps. The target maps will be transformed into treatment maps with the help of a support and decision system, which corresponds to SGI (system of geographical information) structured in layers, with the ability to manipulate different data banks with support information for the mapping. The work control system will simultaneously read the treatment maps and position the duster, generating information on the dosage necessary and the precise location of application, which will be passed on as commands to the injection systems and the pulverized bars. The injection systems will receive the information and will mix the herbicide in the water in the necessary proportions and at the correct time.

62 Technological Development of Special Compact Autonomous Air-Conditioning for Use in Microenvironmental Cabinets for Animal Testing Laboratories

Project Coordinator:
Habib Guy Marie Nahas

Company:
Hvac Engenharia e Comércio Ltda.

Approved value:
Phase 1: R$ 61,000.00

Conventional air-conditioning equipment on the market fails to meet the technical requirements when used for thermohygrometric control and of levels of ammonia of the interior ambient air of the microenvironmental cabinets. These conventional pieces of equipment are sized merely for macroenvironments and for human comfort, not meeting the requirements of animal testing laboratories. The proposed equipment would provide the correct sizing of volumes of air in the air-conditioning system for heat exchanges between the interior and the exterior air, as well as the safe dilution of the ammonia vapors generated by the animals. Also envisaged

is the sizing of a piece of equipment with air condensation, autonomous working, totally automatic, microprocessed, easy to regulate from the point of operation, with visual temperature and relative humidity indicators, including batteries for warming, humidifying and filtering of air, electro-electronic controls, silent working and of small dimensions, able to cope with a maximum of two microenvironmental cabinets. Installation is envisaged for a window and/or hole in the wall, with ease of operation and preventative and/or corrective maintenance. The result is important for the enhancement of animal testing processes and for the guaranteed quality of the experiments and/or scientific results.

63 Obtaining (gamma) MnO_2 for use in Batteries from Different Manganese Compounds

Coordinator:
José Vicente Valarelli

Company:
Fermavi Ind. e Com. de Prods. Químicos Ltda.

Approved value:
Phase 1: R$ 66,926
Phase 2: R$ 182,390

This project proposes the evaluation and the improved use of manganese minerals in Brazil through the development of processes that converge towards obtaining gamma-MnO_2 (nsutite) used in the manufacture of Le-clanche and Alkaline type batteries. In phase 1 proposals were made for methods of obtaining y-MnO_2, with a structure of nsutite from different raw materials. Two of them achieved good performance, but only one of them is recommended for development. Conversion of the natural mineral from the Raizama Mine in the municipality of Cavalcanti, GO, was carried out. The mineral is essentially composed of Hollandite ($BaMna0_{16}$). The mineral was ground up and submitted to enclosed heating, transforming it into Hausmannite (Mn_3O_4). This was followed by aqueous leaching with the significant elimination of Barium. The conversion of Hausmannite into nsutite was successfully achieved. However, the method proved not to be economically viable. Studies concentrated on the conversion of synthetic rhodochrosite of high purity, through heating in an oven with alternating flows of (water vapor + air) and (water vapor + oxygen). Virtually pure synthetic nsutites were obtained, with the structure of y-MnO_2 and with a density of around 1.2 g per cm3. In phase 2, the intention is to build a rotating heating vessel with sections for the heating of rhodochrosite in an atmosphere of (air + water), with a chimney for the escape of gases, as well as density increasing sections, on a production scale of some 100 Kg/hour.

64 Applications of Lasers in Materials Processing

Coordinator:
Spero Penha Morato

Company:
LaserTools (Incubated at Cietec/Ipen)

Approved value:
Phase 1: R$ 24,300 / US$ 20,600
Phase 2: R$ 87,500 / US$ 70,000

The objective of the present proposal is, during the first Phase, to develop methods and advanced procedures for the use of Ipen's Central Processing of Material by Laser (CPML) as a processing instrument (cutting, drilling, soldering and surface processing) for industrial materials (steels, ceramics, silicon etc.). It is also expected to identify those sectors of the metal/mechanics industry that are potential candidates for the use of the CPML as a job shop for the development of processes and for the delivery of specialized services in the areas of tooling and welding. In the medium and long term (phase 2), this proposal looks towards the use of a CO2 laser as a complementary tool for the processing of materials in line with results obtained with the CPML. In this second phase, the objective is to develop and consolidate methodologies and laser processes for use in industrial applications of greatest demand. For this purpose, it is intended to lay the foundations of a job shop at LaserTools, that will offer the productive sector an array of laser tooling services. Currently the main industrial uses of lasers are for cutting materials. However, other types of work using a greater variety of materials have expanded considerably. LaserTools is a limited company of shareholding partners who are involved directly or indirectly in developments undertaken in Ipen's Division of Applied Optics.

4th BIDDING INSTRUCTIONS

65 SISOFT 14001 – Software for Supporting the Preparation of an Environmental Management System

Coordinator:
Sahadev Anantha Krishnan

Company:
Biotec Assessoria e Serviços Ltda.

Approved value:
Phase 1: R$ 28,294

The present piece of research is intended to set up and develop SISOFT 14001 software, an information technology tool intended to offer the following facility: to set up an environmental management system (EMS) in a company, step by step; to manage the daily tasks required by the EMS through an automated tracking and documentation system; to create an audit (due-diligence) system; to facilitate the online exchange of information within the organization, and to facilitate the management decision-making process. Sispamte software, developed and sold by the company Sensora Sensoriamento e Geoprocessamento, will be used as the basis. This is a system for recording data and producing cartographically referenced information and it is noted for its logical structure and ease of use. The implementation of an EMS brings various advantages, among which are: credibility, lower risk, and less pollution; increased profit margins, and an improvement to the internal management system. ISO 14001 standard supplies the specifications for developing an environmental management system, consisting of establishing and maintaining a policy with a commitment and strict adherence to environmental conservation; developing a plan taking into account all the aspects of the organization and current legislation; implementing a program to attain the plan's targets and goals; establishing procedures to monitor the organization's environmental performance and its compliance with established policy.

66 Development of a High Performance Ozone Generator

Coordinator:
Wilfredo Milquiades Irrazabal Urruchi

Company:
Aluísio Pimentel de Camargo - Micro Company

Approved value:
Phase 1: R$ 44,000
Phase 2: R$ 171,067 / US$ 8,984.70

The present piece of research consists of developing new types of generator intended to increase the efficiency of ozone production. Matters relating to the lowering the cost of the generator production and the consumption of electricity in its operation will be studied. Taking into account the climatic conditions prevailing in Brazil, the operational difficulties of installing ozone generators available in the international market, allied to their high cost, the purpose of the project was, in the initial stage, simply to develop technologically a high-performance ozone generator. The work was carried out based on conventional ozone generators, produced commercially by the company Qualidor Saneamento Incorporação. The generators were developed based on cylindrical cells where the ozone production is based on electrical discharges with specially prepared dielectric barriers to obtain high productivity, with a high concentration of ozone and low electricity consumption. Systems appropriate for drying and purifying the air were developed as an integral part of the generators, achieving relative air humidity of close to zero and a dew point of less than -40° C. This concept of implementing an air purification system is a determinant factor in adapting the generators developed to this country's climatic and atmospheric conditions in order to ensure appropriate degrees of productivity and durability. The air humidity produces nitric acid during the production of ozone, damaging both the equipment and the environment. The most important result of the First Stage of this project was to complete building an experimental generator able to produce 33 g/h, at a concentration of 1.8 per cent ozone, in contrast to the capacity originally manufactured by Qualidor of 7g/h and a concentration of 1.2 per cent. Another important characteristic achieved by the equipment built is its continuous operation for long periods, in principle, for more than a week. Based on these results, the following work will carried out in the Second Stage: the development of peripheral equipment to ensure proper and reliable working of the generator for each type of application chosen for the project, with emphasis on automation, including a digital control system of its various operational functions, coupled to a microprocessor control system; construction of generators to meet demand in terms of carrying out in situ experiments; improvement of fixed laborato-

ries (ITA and Unimep) for monitoring and qualifying the generators to be constructed and the materials to be handled by them; and the implementation of a mobile laboratory station for the analysis of ozone and humidity content, to appraise the working of the generator over time, and properly to collect samples of the materials treated with ozone produced by the generator.

67 Improvement in the Quality of Precious Stones through Microbiological Purification and Induction of Color through Ionizing Radiation

Coordinator:
Etsuko Ikeda de Carvalho

Company:
TRON Tec Radion Tecnologia da Radiação Ionizante Comercial Ltda.

Approved value:
Phase 1: R$ 35,400

The Brazilian precious stone market is worth millions of Reals and in general they are channeled abroad through the export of crude stones at very low prices; then, after being treated in various ways, they are re-imported. Generally speaking, this treatment adds value of up to ten times the original value of the stone. In terms of economically important Brazilian precious stones, emeralds stand out for their beauty and popularity yet they are marked by the presence of contaminants in their crevices containing iron and sulfur. A number of published papers have indicated that certain bacteria of the *Thiobacillus* genus are able to attack rocky structures, chiefly concrete, and remove the iron and sulfur, leading to the formation of acids that deteriorate these structures. The present project intends to take advantage of the microbiological method, through use of species of the *Thiobacillus* genus, to purify Brazilian gems, chiefly emeralds, the contamination of which is related to the presence of sulfur and iron, in order to add value to the stones and decrease Brazil's expenditure of foreign currency. Similarly, a treatment widely practiced abroad for obtaining topazes, tourmalines and other colored gemstones, using ionizing radiation, is little used in Brazil, to such an extent that stones are sent abroad for treatment, later to be re-purchased by Brazilian jewelers. The present proposal intends to make it possible to treat precious stones using Brazilian infrastructure and installations, lowering the cost and improving the control of irradiated gems.

68 Experimental Bench for Ratifying Software and Hardware for Intelligent Batteries

Coordinator:
Gilberto Janólio

Company:
DCSYSTEM Energia e Telecomunicações

Approved value:
Phase 1: R$ 49,600
Phase 2: R$ 60,200

The purpose of the present piece of research is to develop an experimental bench for ratifying software used in sizing and studying the dynamic behavior of lead acid and special batteries. With this bench and the validation of the software, it will be possible to develop methods and tools for the diagnosis and prevention of operational conditions, and the useful life of systems using direct current essential to the performance of equipment used in telecommunications companies. These include fixed and mobile phone switchboards and biomedical products, such as organs for transplant. The adaptation of this software to a suitably integrated and validated piece of hardware will enable the development of this project. Another of its goals is to ascertain, with a high degree of accuracy, the capacity of the direct current system, especially in completely sealed batteries which allow no access for developing diagnostic and preventive maintenance and, also, fully implantable batteries that similarly have no access faculties for diagnosis and maintenance. This adaptation is expected to give rise to "Software and Hardware for Intelligent Batteries".

69 Anodic Oxidation with Aluminum Plasma in an Aqueous Medium

Coordinator:
Gerhard Ett

Company:
Anod-arc Serviços e Comércio Ltda.

Approved value:
Phase 1: R$ 67,566.20

This project seeks to obtain compact aluminum oxide layers with a hardness similar to corundum (2300 Hv), through anodic plasma oxidation, in water, of aluminum, other reactive metals, and their alloys. Both the process and the layers obtained bear little resemblance to the traditional process of hard oxidation (maximum 700 Hv 0.5 N). The proposers intend to develop the process and optimize the parameters according to the costs and properties of the layer obtained. Differences in the coefficients of thermal expansion in use and thermal cycling can be corrected by including additional oxide. The relatively low hardness of the layers obtained by hard anodization can be explained by their dentiform structure. It is not proportional to their resistance to wear but is confined to the large number of uses where abrasive grains (or the shape of the contact pieces) enable high punctiform pressure. The structure of the layers obtained by the new process will not suffer from this restriction.

70 System for Monitoring Urban Public Transport Vehicle Fleets

Coordinator:
Claudemir Marcos da Silva

Company:
Neuron Engenharia and Comércio de Equipamentos Eletrônicos Ltda.

Approved value:
Phase 1: R$ 38,047.45
Phase 2: R$ 130,000 / US$ 2,000

The project aims to establish of a System for Monitoring Urban Public Transport Vehicle Fleets designed to monitor the punctuality of buses or vans through the use of radio signals along pre-established routes. Besides informing the moment when each vehicle passes by the radio devices, the system can also monitor other parameters, such as, for example, the speed of the vehicle and the number of passengers carried. The information collected from the vehicle is transferred by radio to a collecting station coupled to a central computer by radio or a telephone line. This computer processes the information received to help assess the system's punctuality, the distances covered, the number of vehicles in operation, costs, speed control, etc. It also enables the municipal authorities to monitor the service quality. Under the proposed scheme, each vehicle will be fitted with a recorder able to receive and store the information transmitted by the landmark stations distributed along the routes. At the end of the day, or at any other time, the recorders in the vehicle download the information stored at collecting stations. These stations are connected to a central computer to process the information and produce reports. The recorders are carried on each vehicle in the fleet and they consist of a radio transponder, an antenna and a control board. The transmitters are fixed, distributed along the bus routes, installed on posts or next to traffic lights and they consist of a transponder, an antenna and a control board. In Stage 1, a prototype of the system, consisting of a collecting station, a transmitter, and two recorders, was built. The feasibility of the system was checked and the project team was able to deal with various aspects related to its implementation. The purpose of Stage 2 is to carry on the work, completing solutions to the main questions relating to the construction of the monitoring system and the development of prototypes of the system's equipment.

71 Program Decompressing System for Risc Processor

Coordinator:
Silvio Luis Lima Nogueira

Company:
IDEA! Sistemas Eletrônicos Ltda.

Approved value:
Phase 1: R$ 41,300

The purpose of this work is to develop a computer program decompressing system for Risc processors. The central idea of this approach is to encode expression trees and operand sequences separately using Huffman coding. Decompressing the program is done using a decompression module based on dictionaries. The growth of the market for dedicated systems (embedded systems) has led to the emergence of a project method known as System-On-a-Chip (SOC), where a processor, integrated with memories, DMAs, I/T ports, and other modules, is designed to minimize the cost of the system. One of the most difficult tasks in an SOC is to make the application program fit within the specified area of silicon (microprocessor). This problem is particularly critical for industry. IDEA! Sistemas Eletrônicos has collaborated on research into the compression of programs on SOCs developed by Prof. Guido Araújo and his doctoral students at IC-Unicamp. The idea

consists of storing the compressed code in on-chip memory, decompressing it online during the search for instructions. The commercial feasibility of this proposal was recently demonstrated by the launch by IBM of a PowerPC (CodePack) processor with similar but fewer features. Research into this project has already reached the point where the results achieved encourage its commercial sale. The final objective of this proposal is to implement a decompressing system to be sold as core software in IP (Intellectual Property) providers.

72 Development of an STM-1 Multiplexer for Optical Access Networks

Coordinator:
Rege Romeu Scarabucci

Company:
Asga Microeletrônica S/A

Approved value:
Phase 1: R$ 26,300
Phase 2: R$ 200,000

The purpose of this proposal is to carry out a feasibility study for developing an STM-1 multiplexer with the capacity to carry up to 63 E1 tributaries at 2048 kb/s for optical access by large users to the public telecommunications networks. The technology to be used is the Synchronous Network, developed in recent years and standardized by the International Telecommunications Union (ITU) as SDH – Synchronous Digital Hierarch. Synchronous Network Multiplexers are the best communications signal carriers known. They were developed to carry everything from low-speed digital signals in their small containers to very fast data signals, used, for example, in supercomputers. The all-encompassing supervision process adopted in the Synchronous Network, with information available on the status of the communication, in failures and on performance – as well as enabling centralized management – is radically transforming the quality of public communications networks. The feasibility study for the development of the first Brazilian SDH multiplex equipment will consist of the following: a study of the performance of the chipset recently launched on the world market; a systemic project for two types of multiplexer, a MUX Terminal and a MUX ADM (Add-Drop Multiplex), and planning the stages of the project. It is designed to provide a detailed estimate of the time and cost involved.

73 Call IP – Telephone Switching System for Call Centers Using Voice Over IP

Coordinator:
Tereza Cristina Melo de Brito Carvalho

Company:
Macrolog Teleinformática Ltda.

Approved value:
Phase 1: R$ 44,920

Macrolog Teleinformática Ltda. has a new project for the research, development and implementation of switching systems for call centers using VOIP – Voice Over Internet Protocol, instead of the traditional switchboards with (ACD) Automatic Call Distributors and CTI (Computer & Telephony Integration) interfaces. This new technology is made possible by the constant increase in the performance of networks, as well as by the progress of voice compression technology. Nowadays, networks enable speeds higher than 100 Mb/s and silence compression and suppression algorithms that compress voice messages to 8 kb/s. With these figures, networks can transmit voice information, as well as other data, with high quality. With the development of a device for managing this telephone traffic which we can call a "Call Manager", it is possible to switch virtually all voice information at existing points in the network without the need for a parallel telephone network and a specific telephone switchboard. Within the proposed operating area, the use of "virtual switching" by IP will enable a new level of call centers to be created, introducing countless benefits to users, such as: facilitating the connection of multimedia calls, integrating voice, video, web, e-mail and fax; cost will be lowered; savings will be made through lower rates for long-distance calls and it will also open up the high technology market to small call centers.

74 Ceramix – Computer System for the Formulation and Reformulation of Ceramic Paste

Coordinator:
Edélcio Leme de Almeida

Company:
SpAll – Sistemas de Informações Ltda.

Approved value:
Phase 1: R$ 31,440
Phase 2: R$ 65,920

The purpose of this project is to develop a new piece of software using Artificial Intelligence techniques to make it easier to manufacture ceramics in this country, taking into account that the main properties of the sector's raw materials (chemical and mineralogical composition, particle size and the cation exchange capacity) are always unique; there are no two that are identical in nature. When one of them must be replaced, all the ceramic paste has to be reformulated, an extremely complex task in the manufacturing process. This software will run under Windows 9X and NT, because of their large installed base. The composition of traditional ceramic products (tiles, porcelain, chinaware, etc.) involves countless natural raw materials, such as clays, kaolin, feldspar, talc, and quartz. What we propose is to write a new piece of software using an advanced GUI, to carry out the same basic functions as Reformix, but with countless implementations. The use of Artificial Intelligence techniques to create a database will make it possible to include a Wizard in the software to help users to identify errors in product formulations and in the choice of raw materials. An initial study will be carried out of the various computer implementations of the Simplex algorithm, to check which implementation will be the most efficient in this particular case. The programming language chosen is Delphi, in conjunction with the Paradox database handler.

75 Development of a Bacterial-Toxoid Vaccine to Prevent the Poor Egg-Shell Quality Syndrome in Breeder Birds and Commercial Laying Hens

Coordinator:
Masaio Mizuno Ishizuka

Company:
Livet Produtos Veterinários Ltda.

Approved value:
Phase 1: R$ 51,274.50 / US$ 0
Phase 2: R$ 17,550 / US$ 17,211

The present piece of research is intended to continue the study of the poor egg-shell quality of breeder birds, and, in particular, commercial layers in Brazil, in order to develop a bacterial toxoid vaccine to prevent or minimize this problem (stages 1 and 2, respectively, of the action plan). In the light of the substantial economic losses in Brazilian poultry raising, deriving from the poor development of the egg shell (around R$ 79 million in 1996), and the observation that part of the cause of this problem could be connected not just to age, nutrition, genetics, or the environment, but also to the health of the birds – involving specific pathologies, including alteration to the metabolism of intra-medullar calcium, caused by unknown or little-studied infectious agents – Livet Produtos Veterinários has begun a microbiological study of the bone marrow of the femur, tibia and metatarsus of birds with altered egg-shell quality. As a result, it was observed that the change in the calcification of the bone marrow and consequent malformation of the egg-shell may be related to the bacterial etiology including its respective toxins. Field experiments have enabled the identification of bacteria such as *S. epidermides*, *S. aureus*, *Haemophylus sp.*, *Streptococcus sp.*, *E. coli* and *Bacilus sp.* in the birds' bone marrow without creating a problem for the egg-shells in the same breeding stock and the preparation of an experimental vaccine based only on the S. aureus. Vaccinated and non-vaccinated birds show a relationship between the presence of the bacteria and the re-absorption of calcium into the bone marrow.

76 The Use of Molecular Techniques in Farming: Improvement of the Genealogical Recording of Cattle and Horses

Coordinator:
Cynthia Rachid Bydlowski

Company:
Linkgen Biotecnologia Veterinária e Agropecuária S/C Ltda.

Approved value:
Phase 1: R$ 20,000 / US$ 24,283.20
Phase 2: R$ 0 / US$ 94,282

The purpose of this project is to standardize the analysis of micro-satellite DNA regions in cattle and horses, so as to enable both checking paternity and maternity as well as helping to identify the animal by means of genotyping, in order to complete the genealogical records. At present, few genealogical recording services in Brazilian breeding associations use the technique of typing blood groups to check the validity of their records of animals. This technique has problems that can be overcome by the analysis of micro-satellite DNA regions. Improving the recording system will enhance the organization and add

value to the different breeds in Brazil. At this stage of the project, it is intended to identify polymorphisms in the hyper-variable micro-satellite DNA regions of cattle and horses using the PCR (Polymerase Chain Reaction) technique. The DNA was prepared from the blood cells and/or hair follicles of the animals and the polymerase chain reactions were carried out using different pairs of specific oligonucleotide initiators for the micro-satellite regions. Through these studies it is intended to characterize the individuality of animals of the same breed, whether or not related. To examine the polymorphisms of the expanded fragments, a system of electrophoresis in polyacrylamide gels and coloring with silver nitrate was employed.

77 Development of a Low-cost, Geo-referenced, Electronic Penetrometer

Coordinator:
Nelson Luis Capelli

Company:
DLG Automação Industrial Ltda.

Approved value:
Phase 1: R$ 24,910
Phase 2: R$ 147,360

In the first stage of the project a technical and financial feasibility study was undertaken for the manufacture of a low-cost, geo-referenced, electronic penetrometer. An initial prototype was built for the main purpose of identifying potential technological and financial difficulties. The function of the proposed equipment is to determine the cone index (resistance of the soil to penetration), as a function of the depth of penetration and geo-referenced position of the equipment. This electronic penetrometer will enable data to be obtained swiftly, accurately and at a low operating cost, for the preparation of geo-referenced maps of layers of compacted soil. The construction of the initial prototype showed the technical feasibility of developing a commercial product. Pilot equipment will be developed to be assigned, by way of demonstration, to research institutions and companies interested and qualified, in order to subject it to normal use and thus identify any weak points. It is also proposed to achieve a finished product intended for sale by the company associated with the project. The determination of the occurrence of compacted soil layers is essential to scientific studies requiring a survey of the local control of experimental areas and it will contribute to determining the physical state of the soil, both in pedological studies and in those designed to assess the machine-soil-plant relationship. The initial prototype of the equipment uses a cell with an extensometric load as a sensor of the penetration strength. An electronic ultrasound type sensor is used to measure the depth of penetration. The geo-referenced position, furnished by a Global Positioning Systems (GPS), is read through a serial interface. This same interface is used to transfer the data from the penetrometer to a PC. This has non-volatile memory enabling storage of the data and an alpha-numeric display used to configure and operate the equipment and to view the results.

78 Study of the Process of Freezing Bread

Coordinator:
Carmen Cecília Tadini

Company:
FMAIIS Indústria de Alimentos Ltda.

Approved value:
Phase 1: R$ 23,400 / US$ 10,581
Phase 2: R$ 58,082 / US$ 32,566.19

The purpose of this research project is to place on the market an alternative frozen product, to meet, in particular, the heavy demand from convenience stores, including supermarkets and highway stores. The research will be designed to shed light on the knowledge of the technology involved in the various stages of producing bread for freezing, in particular, the parameters of the process during fermentation and pre-baking, and surveying the freezing curves, as well as the optimal distribution and storage conditions, in order to appraise the enterprise's profitability. The manufacture of bread has been automated and improved over the years. Brazil still has market potential for products in the dough and bread sector (other than the cakes segment), since it has low annual average consumption. Specifically regarding industrialized bread, the segment has been growing in production volume and variety. Production and freezing of the bread involves problems such as maintaining the properties of the yeast and its fermenting capacity, maintaining the physical properties of the dough and its ability to retain carbon dioxide over the shelf life of the product.

79 Optical System for the Automatic Positioning of Screens (Sopat)

Coordinator:
Benedito Carlos da Silva

Company:
Akros Engenharia e Empreendimentos Ltda.

Approved value:
Phase 1: R$ 16,280
Phase 2: R$ 156,400

The present piece of research is intended to develop an Optical System for the Automatic Positioning of Screens (Sopat), the purpose of which is to arrive at a definitive solution for a problem faced by manufacturers of flat paper, which causes considerable financial loss. This problem occurs in paper production, giving rise not only to damage, but also, and in particular, causing production stalls for maintenance, with the resultant decline in productivity. At the beginning of the paper manufacturing cycle there is a piece of equipment that undertakes pre-drying of the pulp paste. This equipment consists of large cylinders, beneath a synthetic fiber screen which supports the paste. When stretched, it revolves the cylinders at a speed of up to 1,000 m/min. As the surface of the cylinders is flat, there is a need for an active control of the position of the screen over the cylinder, which, under normal conditions, has a tendency to shift to one side. The solution used at present is a mechanical system, which has worked, but with reservations. To make matters worse, the environment in question is subject to temperatures of around 120°C, with high humidity and chemical steam. Sopat intends to solve the problem of the positioning of the screen through the use of optical sensors, employing bundle type optical fiber to enable information to be sent and received without touching the equipment, which is immune to environmental conditions and will be installed together with a micro-controller outside the equipment.

80 Development of Advanced Materials for Lithium-Ion Battery Electrodes

Coordinator:
Antonio César Ferreira/ José Alberto Rodrigues Ferrão

Company:
UniTech Ltda.

Approved value:
Phase 1: R$ 30,500
Phase 2: R$ 55,940 / US$ 99,979.30

The present research project is intended to develop local carbonaceous materials to be used in the manufacture of lithium ion batteries, a product made up of two electrodes that intersperse lithium ions in organic and lithium salt electrodes. The main materials used as cathodes are lithium oxides of the type: LiMn2O4; LiCoO2 and LiNiO2. And, the main materials used as anodes are made up of carbonaceous compounds with a graphitic structure. At present, the main uses for lithium ion batteries are electronic devices in general, in particular mobile phones and portable computers. The main features of these batteries are: high reversible capacity (mAh/g), high power density (Wh/kg) and long life cycles. The main materials to be studied are: natural graphite, carbon fiber, sugar and sugarcane residues (bagasse), and coffee beans. These materials have shown great potential for use in lithium ion batteries. The main properties that the carbonaceous materials must have, in this case, are: high reversing capacity for interspersing lithium and being good electricity conductors. The main goal of phase 1 was to obtain a material with a higher capacity at low cost. During phase 2, the materials that proved the most promising were submitted to thermal and chemical treatment to optimize their crystal structure.

5th BIDDING INSTRUCTIONS

81 Pre-Distortion Linearizer for High Power Amplifiers for Land-based Satellite Stations

Coordinator:
Wilton José Fleming

Company:
Beta Telecom Consultoria e Comércio Ltda.

Approved value:
Phase 1: R$ 27,600 / US$ 12,400

The present work is designed to investigate the so-called pre-distortion linearizers, used in satellite communication systems. Initially, a solution for C-band satellite communication will be investigated, and subsequently, the possibility of using it in Ku-band will be assessed. The pre-distortion linearizer creates a transfer function, which is opposed, from

the standpoint of distortion, to that of the amplifier to be linearized. Among its main characteristics are broadband operation and the ability to operate regardless of internal alterations to the amplifier. Development of the technology of digital modulation and compression circuits enables (and even demands) that various carriers be transmitted in the same waveband previously occupied by a single carrier in satellite communications systems. The linear nature of the amplifiers is a predominant factor in avoiding interference with these signals and services. In satellite communication technology, the use of special valves is required. In this case, depending on the desired transmission power, there is no similar solid state valve, or when it exists (for low power), it is very high-priced. To solve the problem of the linear structure, manufacturers have adopted the system of making the power amplifiers (HPAs) run at substantially below their maximum power output. This condition is called back-off and, although technically correct, its cost is high. The solution to this type of problem is to introduce a linearizer, the purpose of which is to compensate for the intrinsic non-linear nature of the HPA gain and phase.

82 Optical Precision Microscope with Synthetic Granite Base

Coordinator:
Fernando de Moraes Mendonça Ribeiro

Company:
MM Optics Ltda.

Approved value:
Phase 1: R$ 45,420

MM Optics is a new company, but firmly committed to participating in and promoting technological Brazilian innovation in the field of optics. It is a small company that is making every effort to produce three models of microscope (MM 1600, high precision, binocular up to 1600x, MM-01 didactic up to 600x, MM- L1 expansion of up to 30x for use in agriculture and teaching applications) and countless other precision systems. With this experience and having already taken part in a development project in the microscopy field with IFSC-USP and Lamafe-EESC, both of USP in São Carlos, MM Optics proposes to develop and produce an innovative microscope, in which its structural part is made of synthetic granite, improving its stability, lowering costs, and thus making it more competitive. Synthetic granite is a material made of natural crushed stone. As a structural material, synthetic granite has excellent mechanical properties, such as: long-lasting mechanical stability, internal damping about eight times greater than traditional materials, a high degree of thermal stability, geometric flexibility and the ability to use metal grafts. We will be developing a process to mold the microscope's structural system in synthetic granite. The process and the optimization of the molding will enable high quality parts to be produced on a large scale. Setting up the entire production process for parts in synthetic granite, we will add the other optical and mechanical components so as to achieve a very high quality, but low-cost microscope. In this way we, we hope to dominate the domestic market and compete in the export market.

83 Development of a User Terminal for Transmitting and Receiving Voice and Data by Satellite

Coordinator:
Joel Muniz Bezerra

Company:
Databus Sankay Ltda.

Approved value:
Phase 1: R$ 25,900 / US$ 11,100
Phase 2: R$ 164,700 / US$ 45,925

The purpose of this project is to develop a semi-fixed voice and data terminal for remote areas and a truck locator for fleet monitoring by satellite. At the end of 2001, the ICO satellite communication system will come on commercial stream, using a constellation of 12 medium orbit satellites. Users of this system will then be able to send and receive voice and data signals through fixed or mobile terminals from anywhere on earth. The ICO group considers Brazil to be one of the three largest markets for this system, particularly, in serving users in remote areas and in monitoring freight trucks. Since Anatel will require present fixed-line telephone suppliers to provide a service for areas of low population density, the ICO expects its system to be a financially feasible option for these operators. In phase 1 of this project, the terminal architecture was defined, the antenna project was carried out, and the RF front-end was built and prototypes of these subsets were assessed. Contact was also established with component suppliers and potential

customers and distributors for the above mentioned equipment. For phase 2, the finishing of the front-end project and the antennas is planned in order to compact and fully meet the specifications, the software and hardware development of the terminal, including the telephone and fax interfaces, definition of the terminal manufacturing procedures and tools and the ratification of the equipment with the ITU, ICO, and Anatel.

84 Ink Jet Space-Time Recorder

Coordinator:
Yoshikazo Ernesto Nagai

Company:
Optron Micromecânica Óptica Ltda. – ME

Approved value:
Phase 1: R$ 9,500
Phase 2: R$ 35,900

The present research project is intended to develop an alternative to the high-voltage sparker used in classical mechanics experiments: a space-time recorder based on the same principle and the head of an ink-jet printer with a piezoelectric element. Classical mechanics experiments in schools and universities, when offered, are generally trivial and with conceptually poor content, in contrast to the elegance with which the theory approaches and solves teaching problems, making use of conservation laws such as linear moment. Nonetheless, for direct proof of such straightforward laws as these, equipment is required. Tracks and air tables minimize the effect of attrition, maintaining a fine layer of compressed air between the moving part and the surface over which it slides. Furthermore, they are equipped with high-voltage space-time recorders leaving fine black dots on waxed paper (or fax paper) over the trajectory and periodically over time. A dangerous inconvenience of this type of apparatus is the high voltage present throughout its length. Fed by common batteries, the space-time recorder here planned could be built in to the moving part, thus avoiding any impediment to the movement. The rest of the equipment would be the same as the conventional track or air table.

85 Development of Natural Christmas Trees for Brazil

Coordinator:
Antonio Natal Gonçalves

Company:
Arboreto Produtos Florestais Ltda.

Approved value:
Phase 1: R$ 41,900 / US$ 700

The Tree Physiology Laboratory (Department of Forestry Sciences - Esalq/USP) is part of the Thematic Clonal Silviculture and Forestry Vivaria Program. This program has been undertaking basic research, technological development and the transfer of cloning technology, as well as assessment of the political, environmental, social, and legal risks of using this technique and improved raising and use of financial resources. Coupled with research, there is personnel training and technology transfer in the production of clones of forestial essences, chiefly Eucalyptus and Pine, for companies associated with the Forestry Studies and Research Institute (IPEF), other companies, producers, and research institutes, such as Embrapa, with species of bromeliads, orchids, banana, cashew, bamboo, rubber tree, teak, and the *cryptomeria*. The research group's main fields of operation are the handling of macro, mini and micro- clonal gardens, the handling of the production of eucalyptus seedlings, partnerships in the production of micro-propagated seedlings, environmental stress studies in cloning; partnerships in research with equipment and supplies companies for forestial vivaria; *in vitro* mineral nutrition, in vivaria and in the field: clone selection; somatic embryo-genesis of eucalyptus, the production of micro-propagated seedlings of clones of *Eucalyptus spp.*, *Pinus spp.*, teak and other species of forestial interest.

86 Low-Cost Solar Heater

Coordinator:
Julio Roberto Bartoli

Company:
SunPower Engenharia Ltda.

Approved value:
Phase 1: R$ 33,989

The purpose of this project is to offer a low-cost solar heater able to heat sufficient bath water for a family of four, the final cost of which, with accessories and components, does not exceed R$ 100. The result of nine years of feasibility studies and analyses, it began soon after Sunpower Energia Solar Ltda. began operating. At the time of the Earth Summit 92, the first prototype of the solar heater was built to

take part in the event's companies exhibition. It was based on welded PVC film, the body in waterproof, corrugated cardboard, covered to produce the greenhouse effect in the collector (using film employed in flower greenhouses), and a water tank based on a polystyrene box. The concept was presented to Sebrae and immediately approved. Now, it is ready to be approved by an ideas and technological companies incubator, under the auspices of USP, Ipen and IPT. The team is willing to disclose the basic concepts of the project for public discussion.

87 Hybrid, Broadband, High-Gain Amplifier Module, Using Hybrid Copper Plating Technology in an Alumina Substratum

Coordinator:
Alexandre Nunes da Trindade

Company:
Proqualit Montagem e Comércio Ltda.

Approved value:
Phase 1: R$ 33,296

The project consists of developing and constructing an electronic component called a Hybrid Amplifier Module (MHA). This component is used inside amplifiers used in Cable TV (CATV) Systems and Collective VHF/UHF and "C" Band Systems. Another important application is its use in Two-Way amplifiers using two communication channels. These amplifiers enable amplification of TV signals in one direction and data amplification, making possible Home Banking, Home Shopping and Internet services in broadband networks in CATV systems. The first phase will be to undertake the electrical design project for an amplifier in the push-pull and cascode configurations, in order to obtain a circuit with broadband characteristics (40-860MHz), high gain (34dB), a low noise ratio (<8dB), low distortion, solid construction, high reliability and a high degree of repeatability for large-scale production. To succeed, the components will have to be modeled to optimize the circuit and the simulations. In this stage, Proqualit will be helped by the CPqD – Telecommunications Research and Development Foundation's laboratory. The 2nd phase consists of the manufacturing of the prototypes employing alumina layers coated with metal through a Cooper Plating process. This stage will also involve the milling of the steel bases on which the layers will be deposited, as will the covering. The encapsulation will have to be to world standard SOT115J2. The third stage provides for the establishment, development and the design project for setting up the testing of the component. Finally, in the 4th stage, the qualification testing will be carried out.

88 Optimization of the Process of Vulcanization of Retainers through Microwaves and Compound Material Molds

Coordinator:
Antonio Carlos Alvarez Fasano

Company:
OmniTek Tecnologia Ltda.

Approved value:
Phase 1: R$ 48,776

This project is designed to develop a process of vulcanization of retainers through microwaves and molds in compound materials, in accordance with the subject of a doctoral thesis. Work already carried out includes the study of the behavior of polymers and plastics to be used at industrial level microwave frequency (2.45 GHz), by placing pieces of material with wavelength guide ends (this stage was carried out jointly between OmniTek and the microwave laboratory of the Polytechnic School), and simulation of the behavior of the system in finite electromagnetic 3D elements (this stage was also carried out with the participation of OmniTek). The new stages include the theoretical sizing of the wavelength guides and sounding chamber, the design of the part to be manufactured and the mold in polymeric PEEK material plus 30 per cent carbon fiber and the establishment and study of method of injecting elastomers that are more appropriate to the project in question. It also includes the manufacture of an injector set and chamber supports to be installed in commercial injectors, injection and vulcanization testing and improvement of the process parameters.

89 Automatic Reconfigurable System for Testing Electronic Modules

Coordinator:
Gilberto Antonio Possa

Company:
Qualibrás Assistência Técnica Dirigida e Comércio Ltda.

Approved value:
Phase 1: R$ 50,001
Phase 2: R$ 278,705

This project involves the development of an automatic reconfigurable system for testing electronic modules to be used initially in testing and repairing the terminal boards of digital telephone switchboards produced by various manufacturers in Brazil. These boards interface with subscribers, public telephones, and with switchboards and devices. The objective is to develop an initial product that will be used in most commonly used digital telephone switchboards modules. The system will be flexible – in other words, its hardware and software must be reconfigurable to enable more than one technology's or manufacturer's modules to be tested; it must be of low cost in implementation and reconfiguration; it will be efficient and fast in the tests; and have a database to store information on the failures and repairs of each board tested to be used for trouble-shooting, making repair services easier. Experience suggests that terminal modules are those with the highest priority (subscribers, public telephones, connections, etc.). It is estimated that there are around a million of these modules in Brazil. The failure rate is estimated around 20 per cent a year and the average repair cost is R$ 200 per module, and the estimated revenues from repairs are only R$ 40 million a year. The services of the PqD's Microelectronics Division will be contracted. This development will also enable Qualibrás to qualify for the supply of testing and repair services to large manufacturers of telecommunications equipment. The demand for these services is growing fast.

90 Reworking Welded Tubular Aeronautical Structures - Steel ABNT (Brazilian Association of Technical Rules) 4130

Coordinator:
Herman Jacobus Cornelis Voorwald

Company:
ESRA Engenharia Serviços e Representação Aeronáutica Ltda.

Approved value:
Phase 1: R$ 39,318

The purpose of the present project is to establish parameters for reworking welded tubes in ABNT (Brazilian Association of Technical Rules) 4130 steel used in the manufacturing of aircraft engine cradles, indicating the amount of reworking and its influence on the mechanical properties of the material (resistance to metal fatigue along with changes to the microstructure because of reworking the welds). Information may result from this project to support the preparation of a guideline on the quality of the number of welds that can be reworked in the sector and still ensure the same level of safety of the equipment. During flight, an aircraft is subject to repeated loads of highly varying size and frequency. It is estimated that 90 per cent of failures, in service, of components that undergo movement of one sort or another, can be attributed to material fatigue. The aircraft engine cradle is a critical aeronautical component that undergoes complex loads, and fractures caused by fatigue are constantly found. This component, manufactured in ABNT 4130 steel, includes welding operations during manufacturing , or even reworking, and the process requires considerable analysis and care. A study of fractures in aircraft engine cradles suggests that the welds are the parts most subject to metal fatigue failure. For this reason, the standards in respect of the manufacture of these components are extremely strict and careful, particularly in the case of welding operations, where a zero failure rate is demanded. What we do not have, however, are guidelines on the number of reworkings permitted and their consequent influence on the fatigue of the joint.

91 Solar Collector Manufacturing Process

Coordinator:
Mauro Hirdes

Company:
Nova Aliança Comércio Indústria de Sistemas Solares e Produtos Afins Ltda.

Approved value:
Phase 1 + Grants: R$ 79,385.23
Phase 2 + Grants: R$ 231,935.20 / US$ 1,000

During the first half of 2000, the company NovaAliança (formerly Dynamikarman) and the engineer Mauro Hirdes, the project coordinator, developed a new process for manufacturing solar collectors for heating water. Thus, they arrived at a process proposal based on brazing and on changing the panel material to copper. Because of its innovative nature, it was decided to submit a financing project to develop it to FAPESP. The purpose of the original project was to enable the construction of a new type

of high-efficiency collector, known as "Cellular", and it had undergone corrosion and supply problems in its original design concept – aluminum roll-bond panel. The collector, unconventional in its construction, has a capture panel made of two sheets shaped and welded to each other so as to form channels along which water can flow. The interconnection between these channels, in a network similar to a hexagonal beehive, makes the panel highly efficient at capturing solar rays. Impressing with elastomer and spot welding was employed as the manufacturing process, and copper was chosen as the basic material to avoid problems with corrosion and to increase the efficiency of capturing the rays of the sun. A cooperation agreement was arranged with the Materials Characterization and Development Center – CCDM, of São Carlos Federal University, to provide technological support for the project.

92 Development of a Tool for Optimizing Structures

Coordinators:
Susana Angélica Falco Meira / Wolodymir Boruszewlski

Company:
Fibraforte Engenharia Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 38,400 / US$ 6,000
Phase 2: R$ 101,200 / US$ 65,000

The purpose of this program is to develop information technology procedures and tools that are more efficient and have broader coverage to optimize structures, using MSC/Nastran to model and analyze structures and the Faipa and DOT software programs for optimization. In practical optimization applications for the structure of satellites, carried out at Inpe, it was observed that the optimization algorithms available in the MSC/Nastran structure analysis software were not very efficient from the standpoint of convergence and arriving at the global optimum. There are general purpose software programs available that offer more powerful and efficient optimization algorithms. One of them is DOT – Design Optimization Tools, sold commercially by Vanderplaats Research and Development. Another software program available is Faipa – Feasible Arc Interior Point Algorithm, developed under Coppe's Mechanical Engineering Program. In the first stage of this program we sought to show that optimization in structural projects carried out with more solid optimization algorithms, such as DOT and Faipa, together with MSC/Nastran for modeling and analyzing structures by finite elements, are more efficient and lead to better results than the problems solved with the algorithms available in the MSC/Nastran optimization modules.

93 Pulsing Current and Squared Wavelength Rectifier for Anodizing Aluminum

Coordinator:
Elisabete Jorge Pessine

Company:
Termocontroles Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 49,806

The technological innovation proposed here, to be developed jointly by Termocontroles and Unicamp-Ipen (São Paulo State University - Campinas and the Institute of Nuclear and Energy Research), consists of the manufacturing of a pulsing current and high-power, squared wavelength rectifier appropriate to the hard anodization process to be used on an industrial scale. Anodization is one of the best methods of giving aluminum a protective coating. The hard anodization process permits thicker coating than the conventional ones. However, they are restricted by the composition of the aluminum alloys, by the temperature and by their degree of burning. High temperatures encourage the formation of an external soft and porous anodic layer, reducing resistance to wear and significantly limiting the increase in thickness. The advantages of anodizing aluminum alloys carried out using squared wavelength pulsing current rectifiers, compared with processes using only continuous current, range from a saving of 25 per cent in use of reagents, including the achievement of thicker layers (50 - 700 µm) faster, whilst obtaining a coating which is more resistant to corrosion and abrasion, since the layer is generally more homogeneous and less porous, without burning. In hard anodization of large aluminum parts the rectifier needs to be high powered, since the Al2O3 film is an electrical insulator. The feasibility of constructing a prototype will be established in the laboratory.

94 Improvement of the Surface Properties of Industrial Components through Three-dimensional Ionics Implementation

Coordinator:
Raul Murete de Castro

Company:
Metrolab Engenharia Ltda.

Approved value:
Phase 1: R$ 36,020 / US$ 6,900
Phase 2: R$ 57,220 / US$ 114,414.75

Having achieved significant results in an experiment involving ionic implementation by immersion in plasma (IIIP), the use of this method is now being tested in some companies in the State. Ionic implementation (II) is a method of surface treatment with great impact in the new materials field and has been used in some state-of-the-art companies. The main factor restricting this process in more generalized industrial applications, however, is the nature of its line-of-sight implanting, which makes it different or impossible to engage in three-dimensional treatment of geometrically complex parts at low cost. In turn, ionic implementation through immersion in plasma (IIIP) has been opening up new frontiers and opportunities for industrial application. This processing takes advantage of implanting without line-of-sight and enables it to be independent of the area to be treated. In the first stage, development of part of the HIP(INPE/Metrolab) equipment in respect of the high-performance plasma source, was sought by using a highly efficient vacuum system and source of glow discharge with controlled potential. In the second, a new vacuum chamber will be built and integrated into the system with a high-voltage pulsar with a high repetition rate and other appropriate equipment.

95 Generation of Digital Elevation Models using Radar Measurement with Images from the Radarsat-1 Satellite

Coordinator:
Waldir Renato Paradella

Company:
Geoambiente Sensoriamento Remoto S/C Ltda.

Approved value:
Phase 1: R$ 6,500 / US$ 23,750
Phase 2: R$ 122,618 / US$ 6,376.18

The proposed research project is intended to qualify the company in generating DEM-Digital Elevation Models, through orbital radar images, to support the preparation of topographical maps and SAR (Radar) Integrated Products for geo-environmental application. The method is based on radar measurement using Standard and Fine images from the Canadian Radarsat-1 satellite. The proposal gives priority, too, to introducing a culture of using radar imaging technology in the company. Brazil is of continental size but has poor cartographic knowledge. Only 60 per cent of the country has been topographically mapped on a scale of 1:100.000 and most of this is out-of-date. In this context, the use of SAR Integrated Products has great added-value potential, but it depends on strict geometrical correction (orthorectification) of the images. The project focuses on generating DEMs of a test area in the Serra dos Carajás (State of Pará), through Fine and Standard RADARSAT images, treated using OrthoEngine SE (PCI Geomatics) software in a radar measurement approach (stereoscopic radar). In addition, the potential for generating topographical maps on the semi-detailed scale (1:100.000) will be investigated. In its second stage, improvement of the results focusing on the generation of Digital Elevation Models in the preparation of topographical maps and Integrated Radar Products for geo-environmental application is planned. Besides this, alternatives will be sought in the international market for devices (hardware and software) enabling GCPs to be plotted in a three-dimensional view (less propagation of errors in the final accuracy of the DEMs).

96 Development of New Kits Destined for the Diagnosis of Intestinal Parasites in Feces Samples

Coordinator:
Sumie Hoshino Shimizu

Company:
Immunoassay Produtos Hospitalares Ltda.

Approved value:
Phase 1: R$ 35,904 / US$ 7,866

The project envisions the development of kits for the diagnosis of intestinal parasites in feces samples. The kits may be industrialized and sold by the company Immunoassay Produtos Hospitalares Ltda. Recent data released by the World Health Organization shows that close to 3.5 billion people in the world find themselves with intestinal parasites, of which

450 million are ill, the majority being children living in tropical areas, including Brazil. Market research indicates that there are few national diagnostic kits destined towards the examination of feces. This project is divided into three sub-projects. The first deals with the development of a simple, practical and low-cost kit, which will permit the collection of feces, concentrating on the parasitic elements and their morphological identification through the optical microscope, which could, at the next stage, be linked to an automatic system. The two other kits characterize themselves as being diagnostically advanced, for use with monoclonic antibodies and the technique of genomic amplification. In this manner, the second kit will be destined to the detection of antigens of *Entamoeba histolytica*, by way of immuno enzyme testing (Elisa). The third kit will be for the detection of *Cryptosporidium parvum*, *Cyclospora cayetanensis* and *Microsporida*, opportunist and emergent protozoa that are present under immune deficiency conditions, such as those observed with AIDS. This kit is based on the amplification of DNA, using a system of biotinylation primers, and the identification of the amplified products on plastic trays treated with avidin, internal marking probes with digoxygenin, and enzyme conjugates anti-digoxygenin (PCR-colorimetry). Kits for the detection of *C. parvum* could also be applied for the analysis of water quality. The present project could open up paths towards the standardization, evaluation and the production of other immune reagents applied in the diagnosis of the other intestinal protozoa, among them the giardiasis extra-intestinal infections by free living amebas.

97 Universal Interface System for Distance Control

Coordinator:
Eduardo Vettori

Company:
InfoDinâmica Assessoria, Planejamento & Treinamento Ltda.

Approved value:
Phase 2: R$ 166,200

This project, in its current stage, already has prototypes that are demonstrating the partial working of the system regarding concepts, computerized presentation of marketing, functional and technological aspects, business plan – focusing specifically on one of the possible markets –, some software already developed and a video of the system in action. Phase 2 will be executed in two stages. The first will complement the existing prototypes, demonstrating the complete working of the system. As a result, we will have a set of devices and accessories that will allow for the control and automation of some home-models, giving them "intelligence" and dynamic distance control (telecontrol). This grouping will then permit, in parallel with the continuation of this phase, a demonstration of the system to possible partners and clients in various segments of the industry and the market, maturing and strengthening their strategic, commercial and marketing aspects, as well as the aspects of working and technological validation. The second stage of this phase will develop the same prototypes, now in a pre-industrial phase. Or in other words, how they should be marketed. In this stage, a standard circuit will also be developed that can be integrated into any electric/electronic device, making it universally distance controllable by any programmable device, using different processors, operational systems, programming language and interfaces. Then at the end of this second stage, it is expected to have three mobile home-models available for demonstration, as well as one fixed model for testing and development. At the end of the project we will have, in a pre-industrial form: a universal chip Suit; a set of basic suit accessories; a group of outstanding residential devices, for demonstration purposes; and control software.

6th BIDDING INSTRUCTIONS

98 System of Detection and Localized Application of Herbicides on Sugarcane

Coordinator:
Luiz Geraldo Mialhe

Company:
Agrionics - Instrum. Equipamentos Agrícolas e Industriais Ltda.

Approved value:
Phase 1: R$ 47,090

The pre-loaded instrumentation available on the market today is almost totally imported and of the "black box" type. These characteristics, in the case of complete systems, are interesting both to the suppliers and to the users, and, when correctly installed,

guarantee a safe return on the investment. Nonetheless, the number of complete systems available on the national market is small, and, given the complexity of their infrastructure, demands a high initial investment and renders obsolete the part of the non-instrumented fleet in use by the owner. Realization of this reality and the perception of a case in point in the fleet of a group of ten herbicide dusters from the Rafard Sugarcane Distillery (União S.Paulo S/A), motivated research aiming to study and develop a system capable of satisfying the necessities of this agricultural operation under critical conditions (declining topography, infestation intensity, use of different products, movement risks, etc.). Currently, in Brazil the use of electronic controls in dusters is restricted to the conventional systems (command of the flow valves from pressure sensor signals) that attempt to maintain the applied dose independent of variations of the velocity of the field tractor's movement. There are exceptions in a few cases of imported equipment of the self-propelled type and the cost of which is extremely high, generally for application under flat topography conditions. This project proposes to develop electro-electronic and mechanical components, software and operational methodology that will permit the assembly of a system of detection and localized application of herbicides on sugarcane.

99 Genetic-Biochemical Properties of Four Strains of Nile Tilapia (Oreochromis niloticus), Aimed at their Genetic Improvement

Coordinator:
Newton Castagnolli

Company:
Castagnolli Aqüicultura Ltda.

Approved value:
Phase 1: R$ 34,990 / US$ 5,222.75

The aim of this project is the genetic improvement of Nile tilapia (*Oreochromis niloticus*) through the dialectic crossbreeding between specimens descended from four populations of this species, originating from different regions. On the Jurema Farm, in Macatuba, SP, where the project will be developed, there are already available tilapia strains of Thai origin imported by the Alevinopar company from Toledo in the state of Paraná, and another strain from the Municipal Foundation of 25th of July, from Joinville, in the state of Santa Catarina. Furthermore, another strain will be obtained from the Federal Rural University of Pernambuco and another from the Piscicultura Tupi company from Guairá in the State of Paraná. The first part of the project will describe the genetic-biochemical characteristics of a group of specimens from each population. During the first phase, the specific objectives of the project include the identification of a better molecular marker for the study of stocks of *Oreochromis niloticus* and the application of this marker for the classification of different stocks. In the second stage, a selection program will be carried out of *O. niloticus* with a view to obtaining an improved production performance, which will be measured by the evaluation of the rate of growth, size of fillet and volume of steak produced. Once defined which breed produces specimens with the best performance, the parental populations will be multiplied so as to obtain an industrial production of this high performance "hybrid".

100 Implantation of the PCR Technique for the Detection of Genetically Modified Foodstuffs

Coordinator:
Janete Walter Moura

Company:
Tecam - Tecnologia Ambiental Ltda.

Approved value:
Phase 1: R$ 26,000 / US$ 4,000
Phase 2: R$ 47,100 / US$ 101,000

The objective is to implement and standardize the PCR technique for the detection of GM foodstuffs, reproducing tests previously carried out in other laboratories and aiming to adapt them to the company. The project means to train personnel from Tecam - Tecnologia Ambiental Ltda. to develop and to offer molecular tests related to the detection of Genetically Modified Organisms. During the first phase, we carried out the detection of the genetic elements introduced into foodstuffs *in natura* through the PCR method, developing specific reagents, standardizing the methodologies of extraction and measuring the sensibility and the specificity of the reactions of PCR. The project was very successful in its first phase and for the second phase we intend to develop our own technique, the successful marketing of which will depend on constant research practice in the area of Molecular Biology. In parallel, we will be carrying out research and standardization of PCR in

processed foodstuffs and other GMOs that may be important in the national scenario. In some countries such as the United States, Canada and the Argentine, foodstuffs that originate from genetically modified organisms (GMOs) have been widely accepted. The rejection of transgenic foods on the part of some European Community and Asian countries is generating a demand for conventional foodstuffs. These markets are demanding the assurance of the absence of contamination by GMOs through their food chain production. A large part of the raw materials exported from Brazil are destined for these markets.

101 Development of Seedlings Quality Control in Laboratories Allied to Biotechnology

Coordinator:
Monique Inês Segeren

Company:
ProClone - Mudas Matrizes de Laboratório

Approved value:
Phase 1: R$ 50,000
Phase 2: R$ 213,000

The objective of the project is the large scale production of healthy seedlings of plants from the Brazilian flora through tissue culture or micro propagation *in vitro*. In ornamental plant market segment, orchids are plants with great commercial value and with enormous export potential. Orchid seedlings can easily be obtained through micro propagation *in vitro*. Currently they are produced in small quantities by collectors, small producers and household growers. The proposal is to create an infrastructure for producing seedlings and a means of cultivation to feed a network of laboratories and producers. The intention is to install distinct processes for the production of micro propagating cuttings and to meet the needs of a network of cuttings producers, supplying them with the means of growing, cuttings, techniques for the implantation of these processes and quality control *in situ*, through nurseries and greenhouses specifically designed for each plant species. The developed work within an integrated network of allied laboratories will improve supply to the internal market and open the way for exporting. During this project a supervision system of the process of cloning of each culture will be developed, as well as the definition of commercial standards for each laboratory in the network. Improvement programs of Orchids and Zantedeschia (Calla) through hybridization and mutations will be carried out.

102 Oral Implant Device for Front Positions with Threaded Fixing in the Second Cortical, Articulated, with Titanium Plasma Spray in the Active Region and Hydroxiapatite in the Paste, Head with an Esthetically Adequate Diameter and with an Anti-Rotational and Screwed Prosthesis Fixation System

Coordinator:
Antonio Vicente de Souza Pinto

Company:
Pro-Line Serviços Produtos Odontológicos Ortopédicos Ltda.

Approved value:
Phase 1: R$ 49,700

The project aims to develop a dental implant device, the technical appeal of which is in the combination and use of strong points from the two models currently most commonly used: the bi-cortical implant and bone integration. From the first model we will use the concept of the fixation of the device in the second cortical, drastically reducing the time for the placement of the dental prosthesis. From the second model we will apply the design of its crown, which offers a much greater capacity than the first in terms of esthetics, asepsis, and the monitoring of the prosthesis system in the replacement of front teeth and treatment of the active surface for a greater area of bone integration. Both are models that adopt titanium as the basic material for their construction, which will be retained in this project. The methodology to be used in the project follows sequentially the following activities: modeling and dimensioning of the prototypes; mechanical testing of wear and tear, compression and cutting ability between the conventional bi-cortical model and the model being proposed here; production of prototypes; and their implantation in animals.

103 Development of a System of Ionizing Radiation Monitors

Coordinator:
Thomaz Ghilardi Netto

Company:
MRA Indústria de Equipamentos Eletrônicos Ltda.

Approved value:
Phase 1: R$ 35,607

The company is developing research into biomedical instrumentation, mainly in projects linked to the control of the quality of radiology images. The project intends, during the first phase, to compact an analyzing system of an X-ray beam through alteration to its acquisition hardware, looking to simplify its application in quality control programs in healthcare. In the compacting of the system, some micro controlling devices, available on the market, will be evaluated, in order to provide a connection of the acquisition module to a notebook. Furthermore, we intend to collect data with the intention of studying the behavior of the system with X-ray beams generated by electrical feed of half waves and full waves and to research materials, to build a prototype of an ionization chamber and to study its behavior towards the energy of photons used in radio diagnostics. During the second phase, the intention is to produce compact prototypes of equipment, kVp gauges, dosage rate, dosage level, exposure time, semi-reducing cover, built-in filtering, in keeping with market demands.

104 General Use Computer Program and Software for the Modeling of Drainage and for the Transport of Contaminants in Natural and Artificial Waterways

Coordinator:
Swami Marcondes Villela

Company:
SHS Consultoria e Projetos de Engenharia Ltda.

Approved value:
Phase 1: R$ 41,558

The project aims to develop general use computer programs and the respective software for drainage modeling and for the transporting of contaminants in natural and artificial waterways. The products from this project should solve, in a general way, continuity equations, Navier-Stokes equations, Reynolds equations, transportation equations with turbulence parameters and transport equations of other scales. The solutions will be applied to systems of Cartesian coordinates both 2- and 3-dimensional, 2-dimensional Polar coordinates and 3-dimensional Cylindrical coordinates. These solutions will be generated through alternated grids (movement quantity grid) both uniform and non-uniform. The methods of primitive variables and finite volumes will be used. The solutions will be seek to simulate and to forecast incompressible outflow and variable density outflow, permanent and non-permanent outflow, turbulence and non-turbulence, regular and non-regular domains, the consideration of bed variations and coastline variations and elevation of surface water.

105 Development of a Micro Controlled Deformation Gauge with a Communication Interface

Coordinator:
Alexandre César Rodrigues da Silva

Company:
Engel - Indústria e Comércio de Instrumentos Ltda.

Approved value:
Phase 1: R$ 20,390

The project aims to develop a deformation gauge for application both in test laboratories and the research of new materials and in the civil engineering structures. The desired equipment will have a very precise measurement system (better than 0.1 per cent) and high resolution (1 micrometer/meter), the functions of which will be monitored and controlled by a microcomputer control system. Furthermore, a communication interface will be made available compatible with standard IBM/PC microcomputers, so as to facilitate the analysis of the data through specific software programs. Since it possesses predominantly digital properties, the intention is to implement several of its circuits by means of matrixes of logic circuits (FPGA), which are more efficient, consume less power and occupy less space. The conclusion of this project will deliver into the national market a quality product of flexible use, and high technological value, since at the moment no other such manufacturer exists in this market. The equipment has guaranteed applications in the areas of materials testing and the monitoring of civil engineering works.

106 Electro-Mechanical Packaging of Micro Pressure Sensors

Coordinator:
Alfeu Fissore

Company:
Fissore - Consultoria e Assessoria Técnico-Científica S/C Ltda.

Approved value:
Phase 1: R$ 18,400

Pressure transducers based on silicon micro sensors are already a technological reality and constitute a true revolution for different industrial segments such as automotive, medical, biomedical, control, etc. The principal component of the transducers is the silicon micro pressure sensor, the design and manufacture of which depends on its application. It is impossible to develop various different types of micro pressure sensors in the medium term here in Brazil. The research activities of this project have been under development for close to five years and have reached a point in which the results obtained encourage their industrial exploration. The proposal is to design and develop miniaturized electromechanical packaging for the enclosure of silicon micro pressure sensors purchased abroad, in this way assembling the pressure transducers. The micro sensor will be assembled on a ceramic plate made using thick film technology. In principle, two types of exploratory prototypes will be developed, denominated Type A and Type B. Type A will make use of a pressure micro sensor made with ultra modern technology and, in this case, the user will have to supply the circuitry for the regulation of signal standard for its specific use. Type B is a throw-away transducers, the chip for which is also made with cutting edge technology, of high performance, especially designed to satisfy all existing requirements for medical instruments. The pressure sensor must be compensated and calibrated using laser trimming of thick film resistors. The transducer integrates a high performance chip tolerant to radiation, with thermal and calibration compensation circuitry, and a protective gel in a low cost capsule.

107 Use of Clean Technology in the National Production of Active Principles with Pharmacological Activity

Coordinator:
Moacir de Mancilha

Company:
Synthon Especialidades Química Ltda.

Approved value:
Phase 2: R$ 23,882.00

The treatment for pulmonary tuberculosis consists of the association of medication, good nutrition and rest. The first drugs used were streptomycin, isoniazid and para-aminosalicylic acid, all capable of eradicating the tuberculosis bacillus from the human organism. Other effective drugs are etambutol, rifampicin, thiacetazone and pirazinamid. Although the infection is halted quickly, the complete cure requires several months of treatment. Thus, it is of strategic importance that Brazil becomes self-sufficient in these medicines. The production of pirazinamid was discontinued in the country and, in the last 8 years around 79 tons of technical pirazinamid were imported, which signified a foreign exchange cost of US$ 3,333,678. The objectives of this project are: 1) the development of clean methodologies for the production of drugs for the treatment of tuberculosis (pirazinamid); 2) subsequent implementation on an industrial scale. The methodologies to be developed consist of: 3) studying the oxidization of quinoxalin 6 through the use of ozone with catalytic quantities of manganese dioxide, and 4) studying the synthesis of pirazinamid from 2,3-diamino-propionic acid 9.

108 System for the Management of "Dusting" in Agriculture with the Technology of Automatic Acquisition of Field Data

Coordinator:
Cléber Rinaldo Manzoni

Company:
Enalta Inovações Tecnológicas para Agricultura

Approved value:
Phase 1 + Scholarships: R$ 66,342.60 / US$ 2,000

The research intends to develop a system for the management of dusting /spraying activity in agriculture with technology of automatic acquisition of field data, which aims to enable the farmer to have total mastery over the information involved in this activity, such as: data directly concerning the equipment i.e. rate of application (I/ha), velocity of tractor (km/h), quantity of raw material to be applied per treated area and other data involved in the control of the application of raw material (type of application, type of raw material to be used, stage of growth of the product, planting phase, hours/machine worked, reasons for stoppages, location of application and others.) All of the above related data will be collected in the field by collector modules of mobile and fixed

data (hardware) and afterwards uploaded onto a personal computer, to be subsequently transformed into information (management software) that will enable the farmer to automate the programming of the machine's activity, to evaluate the performance of the operator, of the agricultural equipment (tractor and sprayer/duster) and of the process as a whole.

109 Portable Inductive System for the Imaging of Steel Bars in Concrete Structures

Coordinator:
Isaac Newton Lima da Silva

Company:
Tecnolab do Brasil Instrumentos de Lab. Computadores Pessoais Ltda.

Approved value:
Phase 1: R$ 13,295 / US$ 747.30

The project has as its goal the development of the prototype of a compact version of a system for the inductive scanning of steel bars in concrete structures, producing 3D images starting from a beta version already developed, which produces 2D images. At the end of phase 2 of the project, it is intended to have the first version of a device of wide application in the civil construction industry, as well as in other sectors. Today there is greater concern about the safety of concrete structures than before. One of the most important aspects in such structures is the condition of the steel reinforcements. Considerable resources are being spent on research to develop tests on the destructibility of such components. The magnetic scanner is the most advanced instrument for the inspection of concrete structures, providing a magnetic image of the metallic structures. This project intends to make available to the Brazilian market a complete system, including a magnetic scanner and controller, data acquisition, software for viewing, processing and analysis of the image of the concrete, as well as instruction manuals.

110 Recognition of Digital Fingerprint

Coordinator:
Rogério Souza da Mata

Company:
S.M.A Tecnologia Comércio e Serviços Ltda

Approved value:
Phase 1: R$ 49,150

The project is a study into the feasibility (phase 1) and the implementation (phase 2) of devices for the extraction of features and the verification of a digital fingerprint, through the use of an image capturing sensor based on network capacitance CMOS (semiconductor) and a high performance digital signal processor, resulting in the first commercial device of its type to be developed in Latin America. The main characteristics of this proposed device are: implementation using innovative algorithms developed here in Brazil, thus improving the processes involved (image capturing, treatment, extraction of characteristics, storage and comparison); interface inclusion for smart cards, introducing a new security element in the transport and storage of digital fingerprint characteristics and off-line verification; use of devices based entirely on semiconductors, with no optical part for image capturing, rendering circuits more robust and much more compact; low number of components (processor, memory and sensor), small motherboard area, commercially available and locally made components; standardized communication interfaces, facilitating the integration with existing systems or products (OEM) or for the development of new products.

111 System of Tracking, Control and Remote Immobilization

Coordinator:
Samir Aued

Company:
Standard Telecom Ltda.

Approved value:
Phase 1: R$ 16,580 / US$ 7,800

The main objective of the project is to develop a control system for the monitoring, tracking, and remote immobilization of automobiles. This objective will be achieved through the selection and incorporation of the latest generation alternative technologies (such as the two-way pager), which will allow the maximization of the cost/benefit relationship of the final product, making possible its popularization and use on a large scale. The system permits the location, tracking and remote control of vehicles, through the use of satellite locating systems (GPS – Global Positioning Systems) and of the data transmission technology of two-way pagers (Reflex protocol). The fact that a large part of the national territory is already

covered by paging systems, increases the reliability of the proposed security system (there are plans to extend the two-way pager coverage). The proposed system will permit the incorporation of an immobilizing unit via magnetic transponders already developed and in the initial phase of commercialization by Standard Telecom, which will allow for both the local and remote monitoring and immobilization of vehicles. The system will permit the development of new commercial applications in the areas of monitoring and control of freight transportation, security systems and anti-theft of vehicles; the monitoring and remote control of mobile devices, enabling the implementation of various applications in the area of tele-metrics and tele-command.

112 Study for the Development of Distance and Level Gauges Using Microwaves (radar) and Laser (optical)

Coordinator:
Willian Paul Yuzo Abe

Company:
Level Control Comércio, Indústria e Representações Ltda.

Approved value:
Phase 1: R$ 26,240 / US$ 9,417.54

The objective of the research is the development of a level gauge for tanks which will have the properties of good precision and high reliability under the most diverse applications. The current techniques used for this type of measuring gauge with the available devices on the market are: capacitance measurement, magnetic float, manometer or differential pressure transmitter, pendulum, ultrasound, radar and laser. The types of gauges proposed as objects of this research, that is to say, radar and laser, eliminate one of the large problems of level or distance sensors, which is direct physical contact with the product to be measured. This is also the advantage of ultrasound. However, contrary to ultrasound, which depends on the medium of propagation, the proposed types don't suffer interference from temperature, pressure, density or dielectric constant. The potential users are all those who need precise measurements of distance or level. The existing manufacturers of the proposed equipment are all foreign and number merely five companies world-wide. Since there are so few dealing with this high technology, in prices charged in Brazil are extremely high.

113 Reticulation of Coating, Based on EPDM using Ultraviolet Radiation (UV)

Coordinator:
Ricardo Aurélio da Costa

Company:
Área Química Ltda

Approved value:
Phase 1: R$ 32,207

The chemical industry patented a series of multi-composite polyolefin- amorphous- waxes, such as non conventional keratins for impermeability and painting. The multi-composites based on EPDM are stable solutions, used to modify the interfacial properties of different substrates. Nonetheless, the coating of non-reticulated EPDM, obtained after the evaporation of the solvent, is recommended for temperatures close to or below room temperature, restricting the use of this coating to these conditions. The project proposes to study the technical viability of producing coatings based on reticulated EPDM, in the ultraviolet region, with speeds of reticulation compatible with its continuous manufacturing process. The experimental work forecasts the preparation of the coatings with EPDM starting from solutions prepared according to the description of Patent PI 8701355-0. The solutions will have additives of photo initiators and commercial reticulation agents. The choices of the photo initiators and reticulation agents will be made in accordance with the solubility of these two additives in the solvents or mixtures, used for the preparation of the elastic-like solutions. The EPDM coatings will be prepared and reticulated, varying the concentrations of the photo initiator and the reticulating agent, irradiation time and thickness of the coating.

114 Gearing Pump of Variable Flow

Coordinator:
José Luis Bertazzoli

Company:
Hidrometal Indústria e Comércio de Equipamentos Hidráulicos Ltda.

Approved value:
Phase 1: R$ 46,520

The objective of the project is to develop a gearing pump of variable flow. The expression V = M.

pd. W determines the volume of fluid displaced per turn, with m = module, pd = primitive diameter and W = useful width of the gearing. The dimension "W" is also defined as the position in which the gears are connected among themselves, that can vary from zero up to a maximum limit. The empty spaces between the teeth on the linking sides of the gears are filled by the teeth of internal gears, with such precision that they prevent leaks. The gearing of the internal teeth, that seals the motor gearing, have axial movement. The gearing of the internal teeth, that cover the mobile gearing, do not possess this movement. The gear movement of the mobile gearing is free in the axial paths and also acts as a command piston of outflow and pressure, doing away with what in the competing products is an expensive accessory. The piston advance results from the internal forces transmitted by the pressure of the command oil and by the pressure in the gearing chamber. The recoil of the piston is carried out through the alleviation of the command oil, which increases the resultant internal force on gears' side. If these opposite forces balance each other out with springs, economic and reliable load sensing control is obtained.

115 System for the Low Cost and Fast Drilling of Deep Tubular Wells in Hard Rock, for Obtaining Underground Water

Coordinator:
Roberto Megumi Tomaoka

Company:
Megatech Produtos Mecânicos Ltda.

Approved value:
Phase 1: R$ 16,970

The project aims to develop a system of fast and economic drilling of tubular wells for obtaining underground water in geological formations composed of very hard rocks, with a final drill diameter of 153 mm, and a depth of 350 meters. The system will have as innovation, three basic characteristics: a light and compact drill press for its size, allowing a version with a mast of low altitude (2.5m) brought into play by a motor with power of around 100 HP with hydraulic advance and semi-automatic transmission (power shift), permitting centralized commands and operation by only two technicians; drilling column equipped with a system to remove cut rock through its interior, up to the surface, using a small barrel wire-line; use of a deep drilling tool in the form of a crown, containing the latest generation of super abrasives, sintered in ceramic molds, with the employment of non-conventional processes in its manufacture which reduce its final cost. The parameters for the operating of the tool will define the final properties both of the drill press and the drilling column. The technical-economic viability of the deep drilling tool is the crucial point for the viability of the complete proposed system, permitting a reduction in the order of 70 per cent in the value of the investment in equipment, occasioning a proportional reduction in the final cost per meter drilled.

116 Optical Components in Injected Plastic with Non-Spherical Surfaces

Coordinator:
Sérgio Antonio de Almeida Nobre

Company:
Optovac Mecânica e Optoeletrônica Ltda

Approved value:
Phase 1: R$ 33,000 / US$ 16,236
Phase 2: US$ 140,000

The goal of this research project is to develop the technology for the manufacturing of high quality optical components with non-spherical surfaces thus qualifying the company in the manufacture of non-spherical optical components, products that use this type of component and also to project and build molds and necessary inserts. The manufacture of injected plastic optical components with non-spherical surfaces involves component project aspects of the molds, inserts and necessary tools, which even in worldwide terms, are only accessible to a few companies. Products with applications of plastic optical components are in increasing demand, given the volume of sophisticated products and the low cost that they bring to the market each year. Examples of products that use this type of technology are the low-cost video camera, compact disc readers, optical linkages, infrared and visible light sensors, etc. The surface of the inserts that make up the most critical parts of the cavity of the required injection molds possess optically polished surfaces that are devised by elaborate mathematical functions. For the manufacturing of these surfaces it is necessary to have equipment with numerical control, with advanced control prerequisites and extremely critical mechanical stability, since the seams of the machinery tooling must be less than the

width of the light wave over which the component will work, that is to say, the surfaces must present a final finish comparable to that obtained through optical polishing.

117 Production of Pigments by Monascus sp in Semi-Solid Fermentation

Coordinator:
Beatriz Vahan Kilikian

Company:
Germinal Indústria e Comércio de Produtos Químicos Ltda.

Approved value:
Phase 1: R$ 21,000 / US$ 10,229.32
Phase 2: R$ 197,260 / US$ 20,685.56

The present project proposes to set up a production process for organic pigments of microbic origin, to be used in food. Species of *Monascus* fungi will be cultivated in a semi-solid substrate made from the cassava root, this being one of the innovative aspects of the project, since the fungi referred to are traditionally cultivated through a rice base in China and Japan. The use of a low cost substrate, abundant in Brazil and non seasonal, constitutes an advantageous aspect over the traditional process. The implantation of a process under controlled conditions of fungus cultivation constitutes another aspect to be highlighted, since in the original countries the fermentation is carried out without controls, under appalling hygienic conditions. The obtaining of a product under controlled conditions would qualify it for entry to the market for food ingredients. It is estimated that the Brazilian consumption of the red pigments of *Monascus*, monascorubramine and rubropunctamine, is in the order of 500 tons of product per year, which represents a turnover of close to R$ 5 million. This consumption may increase when one considers that cochineal carmine and nitrate salts and nitrite are still being used, which give rise to toxicity due to the formation of nitrosamine. The present project, ultimately, aims to produce organic pigments, but social aspects – job creation – and technologies – implantation of a technological base for this and other processes of similar characteristics – will be taken into consideration.

118 A Computerized System for the Analysis of Human Chromosomes

Coordinator:
Antônio Francisco Junior

Company:
Atonus Engenharia de Sistemas Ltda.

Approved value:
Phase 1: R$ 21,600
Phase 2: R$ 173,520 / US$ 22,545

Currently there are various techniques for the study of human chromosomes, both in a morphological focus, whose main technique is G banding, and through methods of molecular cytogenetics, known as FISH (Fluorescent in situ hybridization). In spite of the growing demand, the offer of automatic systems that assist the work of the geneticist in the collection of data, in the generation of karyotypes and in the study of FISH, is small. The goal of the present study is to develop a computerized system using vision techniques by computer, capable of assisting the geneticist both in the execution of the analysis of the form of the human chromosome, in order to carry out the assisted pairing of the chromosomes, and also to help in the collection and analysis of data for carrying out the FISH study. Through FISH it is possible to execute the cytogenetic diagnosis of embryos and fetuses with increased risk from chromosomal problems. In the case when the FISH is carried out at the initial stage of cell division, one can both determine some illnesses as well as the sex of the future generated individual. This study makes use of luminescent chromosome probes that intrude into part of the DNA chain of a chromosome, emitting light of determined wave lengths. Optical filters are then used to select the light wavelength that needs to be analyzed. The capture and analysis of this luminous standard is the essence of the FISH study.

119 Geophone – Integrated System for Obtaining Geo-Referenced Information for Emergency Services

Coordinator:
Flávio Gonçalves Boskovitz

Company:
Geodados Mapeamento e Pesquisa Ltda.

Approved value:
Phase 1 + Scholarship: R$ 54,138
Phase 2 : R$ 207,085

This project is looking to develop Geophone – an integrated system of geo-referenced information capable of instantly localizing on the digital map of the city the origin of a phone call, to carry out a spatial analysis for creating data on the distance of the point of origin of the phone call to other aspects of interest (hydrants, police precincts, schools, hospitals etc.), the best route from point to point, to look for tabulated data relative to the point of origin, and finally to generate, store and print out a report containing this information. Geophone is a system that uses, in an integrated manner, a phone call identifier, a microcomputer and an exit device. The focus of the research will be to achieve an improvement in the integration of the call identifier with the microcomputer and with the system search platform, in the analysis and exhibition of the information relative to the origin of the telephone caller, so that the operators (firemen, police, rescue and ambulance) provide a better and quicker service. The Geophone is viable. It is already part of the reality of a Center of Attention and Dispatch of the Military Police of the State of São Paulo, implanted within the 17th Battalion in the town of São José do Rio Preto. During phase 2, the research emphasis will be to make a general improvement to the system, creating new tools for geo-processing, improving those already in existence, improving the routines for better performance, developing a fusion between the Operational System of the Military Police and Geophone and remodeling the data bank with links to external data bases. The expansion of the Geophone service to three other towns will be fundamental for its improvement and the design of efficient methodologies of geo-referencing, geo-codification and the acquisition of field data.

120 Flexible Manufacturing of Chocolates and Innovation in the Basic Line of Products

Coordinator:
Paulo Ignácio Fonseca de Almeida

Company:
Chocolates Finos Serrazul Ltda.

Approved value:
Phase 2: R$ 119,800 / US$ 12,355

The present project is the fruit of a partnership between the process development laboratories of the Chemical Engineering Department of UFSCar (Federal University of São Carlos), of the Work Project and of the Industrial Installations of the Production Engineering Department also from UFSCar along with the Cereals and Chocolate Technology Center – Cereal Chocotec, linked to Ital, and the Chocolates Finos Serrazul Ltda. During this second phase, the project develops simultaneously and inseparably in two directions: the management of the processes and the technology of the products. In the case of the management process, the intention is to direct efforts towards the preparation of the company's management and production team, for the feasibility of the process of technological innovation and in the preparation and training of their people for a new manufacturing process to be introduced in a new specially designed industrial plant. From the technological point of view of the new products, the project aims to develop, in partnership with a team of researchers from the Cereal Chocotec Ital's, new recipes: the traditional coverings of chocolate based on buttered cacao bean (white, bitter and milky) and four new types of recipe, denominated organic chocolate (with components produced without the use of harmful agricultural chemicals), chocolate plus (enriched chocolate), chocolate diet (without sugar) and chocolate without lactose. It is worth highlighting the fact that on the Brazilian market, and according to our knowledge, on the world market, as yet there are no recipes for organic, enriched or non-lactose chocolate.

121 Money Exchange System and Foreign Trade

Coordinator:
Valter Francisco Arruda Alves

Company:
Invenire Internacional Informática S/C Ltda.

Approved value:
Phase 1: R$ 45,230
Phase 2: R$ 187,140 / US$ 30,000

The objective of this work is to develop an innovative computerized system for operational support in international exchange and trade in financial institutions. The system will support the banking transactions related to the control of day to day operations, providing a managerial vision of all of aspects of the business. The system will be innovative in the manner that: it will use object-oriented technology; it will support the concept of frameworks; it will blend the

object-oriented development with the development of systems especially based on regulations; it will be multi-level; it will make use of Internet-derived technologies such as communication backbone; and it will be fully integrated into the external networks such as Sisbacen and Swift. This system will show significant advantages over current systems, be they those available on the market, or internally developed by the banks themselves. The proposed system will comprise the following modules: Basic Registration Modules (client, currency, countries, indexes and others); Commercial Operations Module (exportation, importation, inter-banking and financial); Operations Table Module; Accounting Module; Management Control Module; Reciprocity of Clients; Reciprocity of Bankers; Cash Flow in Foreign Currency; Cash Flow in National Currency; Country Risk; Market Risk (Exchange and Credit); Raising of Foreign Currency; and Operations Yield. Initially, a prototype corresponding to a Control Module of Exchange Contracts will be developed.

7th BIDDING INSTRUCTIONS

122 CD-ROM for City Planning

Coordinator:
Eleonora Seligmann

Company:
Cutin & Cafruni Consultores Associados S/C Ltda

Approved value:
Phase 1: R$ 40,200.00

One of the difficulties encountered in the evaluation of urban landscape for the purposes of architectural projects, urbanization projects, projects for the control of urban landscapes and highways has been that of finding a methodology that deals not just with quantitative data, but also with qualitative data. The evolution of General Cinematic Scenography technology applied to City Planning has pointed to some practical results which go beyond the methodologies usually employed in work of this nature. The surveys and inventories of urban landscape already carried out use restitutions of a mnemonic order expressed in sketches, drawings, photographs, films, enquiries with open or closed questionnaires, all on variable bases, therefore not allowing a space-time analysis of all the recorded details. General Cinematic Scenography applied to City Planning allows for the solution of some of the above difficulties. The new programs in non-linear electronic editing have come to create a new possibility for controlling the length of duration of the filming compatible between the cinematographic and videographic registers of large stretches of urban landscape or of highways for the purposes of city planning and landscaping. The present project proposes a revision and fine-tuning of the experiment already carried out and the technical working up of an application.

123 SETAS – Electronic Safety Triangle System

Coordinator:
Francisco Rafael Meyer Pires

Company:
AUTTRAN - Automação de Transportes - Indústria e Comércio Ltda.

Approved value
Phase 1: R$ 75,000.00
Phase 2: R$ 261,900.00

The Electronic System of Safety Triangles (SETAS), aims to introduce an innovatory concept for the prevention of road traffic accidents, based on direct warnings to motorists, within their vehicles. One of the great advantages of the system, from the road safety perspective, is the possibility of alerting drivers immediately a problem occurs, long before the obstacle on the highway is visible to the driver. Many scenarios, with the frequent occurrence of serious accidents could be avoided or be reduced in seriousness. The main point of SETAS is the Sinalerta equipment, the development of which is being proposed here. Sinalerta is a device installed in vehicles and also at fixed points along the highway. In vehicles, the devices are transceivers for short distance communication which, in the case of a collision, automatically activate, in a radius of 300 meters, a warning signal which is received by vehicles equipped with the Sinalerta, and other vehicles by cascade effect, will also reduce their speed, even though they are not equipped with the Sinalerta. In addition, the motorist with the equipped vehicle will be able to activate the Sinalerta manually when confronted with an accident or a situation of imminent danger. The fixed units, which can also be transportable, could be used by the road traffic police and highway administrators to warn motorists. Engineering prototypes of the equipment were designed, manufactured and tested, and the project viability proven by means

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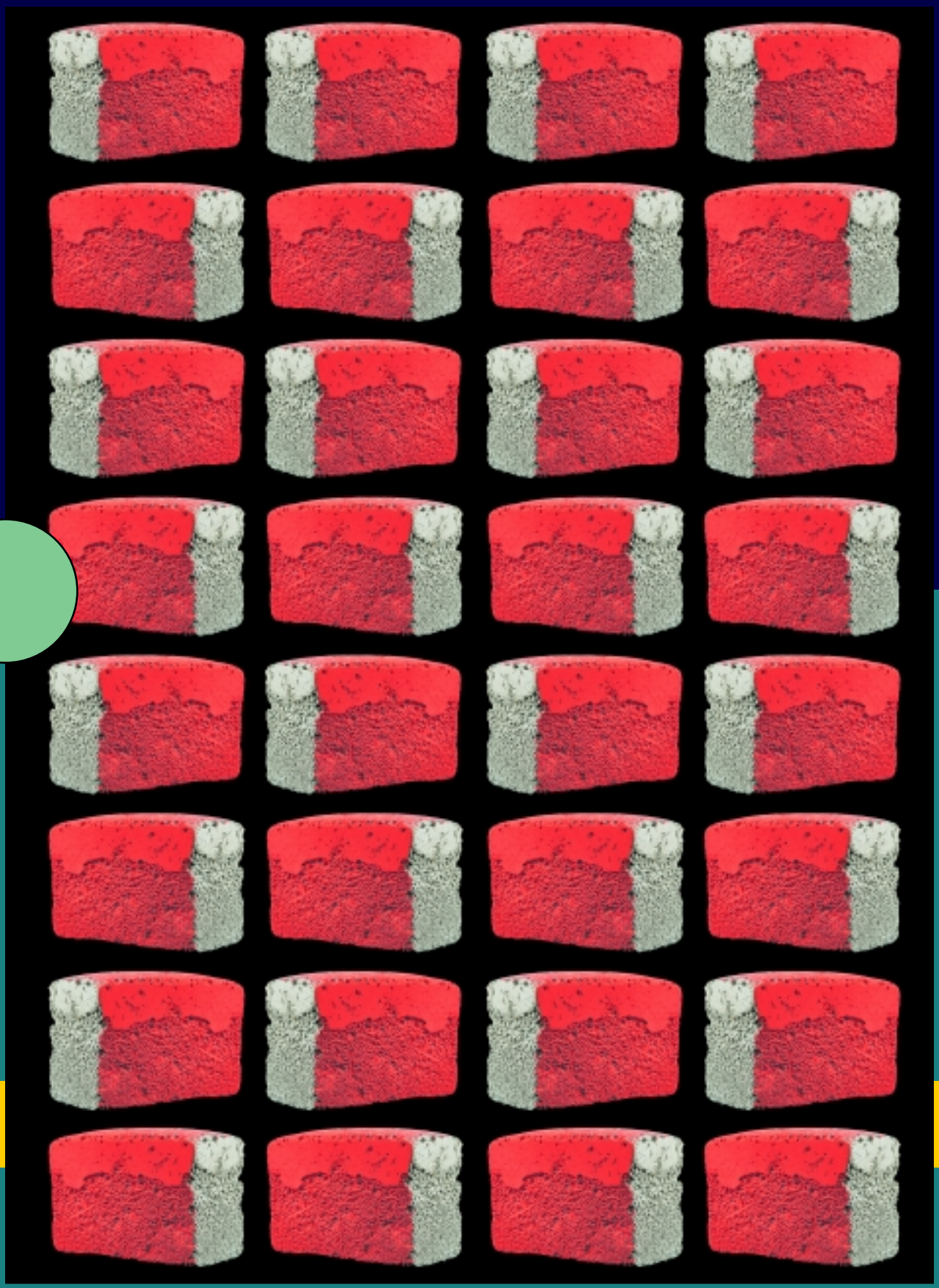

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of the system's deployment, operation and performance in the field. The final planned result is the production of a set manufactured items of equipment, that are fully functional and qualified for full use, which will serve as the pilot batch for the future commercialization phase.

124 Development of Optical Attenuator Technology

Coordinator:
Walter Luiz de Andrade Carvalho

Company:
Fotônica Tecnologia Óptica Ltda.

Approved value:
Phase 2: R$ 11,000.00 / US$ 119,190.00

The project aims to develop optical attenuator technology. These components are of special importance in the installation of modern optical systems and various types of attenuator are necessary for the good administration of the optical power of a system. Initially, existing models of attenuator were studied for the development of a component adapted especially for the needs of amplified WDM optical systems. In this case, existing attenuators present various problems, such as resistance to high powers, losses dependent on polarization and lack of control of the return loss, polarization and the attenuation value. The project aims to resolve these problems using three approaches: 1) attenuation using controlled fracture in the fusion of the two fibers; 2) the use of fibers doped with metallic ions; and 3) the insertion of absorbent elements in the optical path. As a result it is hoped to obtain new high performance components capable of being commercialized in the international optical communications market.

125 Design and Industrialization of Furniture

Coordinator:
Yvonne Miriam Martha Mautner

Company:
Góes & Soares Ind. e Com. de Móveis Ltda.
(ex-Oficina de Arte e Design Ltda.)

Approved value:
Phase 1: R$ 67,829.00
Phase 2: R$ 307,844.82

The project, based on analysis of the furniture sector, proposes an innovative relationship between the design development of furniture and the production process. This relationship is based on the possibility of combining a form of horizontal production, that is, where different components can be produced by different businesses, with the design activity which necessarily precedes this splitting up. The design details each component: platform frames in wood and sheet metal, metal drawers anticipating the possibility of the use of plastic at a later stage, metal fittings, which today are generally imported or produced here at high cost, and smaller components such as clothes hanger racks. To this end, the project centers on work done in workshops and in the laboratory, in order to arrive at a feasible design with a performance test already approved in prototype. The project includes research amongst users and furniture sales personnel to give an indication of the acceptability of the product on the market and to provide elements for the marketing strategy. Also contemplated was the definition of materials, the installation of the production unit and the production of the strategy and the products necessary for marketing.

126 Ultrapurification of Natural Products through Molecular Distillation

Coordinator:
César Benedito Batistella

Company:
Natural Products & Technologies Ltda.

Approved values:
Phase 1: R$ 41,280.00
Phase 2: R$ 208,140.00

This project proposes an alternative method for the refining of special plant oils by means of a molecular distillation technique which, in addition to permitting a higher degree of refinement of the oils, prevents heat sensitive components, such as polyunsaturated fats, from decomposing during the refining process due to the reduced time they remain in the oil. This technique dispenses with the use of solvents and offers great operational flexibility, allowing for the possibility of carrying out the refining of several oils in the same physical arrangement. As a result, the project will obtain oils and their derivatives, such as fatty acids, mono and diglycerides of high quality to be applied in the food, cosmetic and pharmaceutical industries using plants such as mu-

rumuru palm, echium plantagineum, myris and pentaclethra macroloba, since natural products have become increasingly acceptable to national and international consumers. As a consequence, raw materials previously exported with a low value and reduced technology can be commercialized with greater added value and better technological content.

127 Development of a Connectable Crusher Cart linked to a Caterpillar 930 Tractor and its Application in the Production of Organic Material Compost

Coordinator:
Edmar José Kiehl

Company:
Terraviva Consultoria Ambiental S/C Ltda.

Approved value:
Phase 1: R$ 51,770

The present project proposes to develop an adaptable implement for machinery of hydraulic action used in organic compost material (waste) services that deal with the operations of loading, selection and crushing of the material for improving the yield of the process and the standardization of the final product (compost), making possible the reduction of costs and the improvement of the efficiency of application of the compost to the soil. Compost spreading is an important process in the recycling of organic material on agricultural properties and in the systems of industrial solid waste and of municipal garbage, eliminating the risk of pollution through direct application of the waste to the soil, and reducing the environmental liabilities of land fill and rubbish dumps. Methods of natural compost formation using machinery of type retro-excavator and shovel-carrier type have shown themselves to be technically and economically viable for small and medium size enterprises. However, the use of these machines without the necessary adaptations for the activity, leads to some limitations in productivity and homogenization of the final product.

128 Post Fruit Harvesting Protection

Coordinator:
Antonio José Gomes Bettega

Company:
Cyrbe Indústria e Recondicionamento de Rolos Ltda.

Approved value:
Phase 1 + Scholarship: R$ 94,542.60

The goal of the proposal is to create post-harvesting protection processes to perfect the means by which fruits are presently stored or transported in Brazil, aiming to preserve to the maximum its quality for the consumer. The processes can be active or passive, depending on the type of fruit. In the active process, the fruit will remain, temporarily, immersed in a gaseous medium, with chemical agents that selectively impede the growth of the main micro organisms that are the catalysts of their premature ripening. In the passive process, the fruit will suffer a surface treatment which will retard dehydration and will make the contact with micro organisms difficult, even if they are already present in the storage environment. During the first phase, the intention is to set up distinct processes for slowing down the rotting of some fruit during the post-harvesting stage. Brazil, despite being among the largest producers of fruit worldwide, suffers considerably when one takes into account the volume of losses that occur between fruit collection and consumption. In the case of certain products, losses are close to 40 per cent of production, when typically loss should not exceed 10 per cent.

129 Study of the Technical Viability for the Installation of a Bromeliad Bio Factory in the Ribeira River Valley

Coordinator:
Lirio Luiz Dal Vesco

Company:
Atlântica Assessoria Agro Ambiental S/C Ltda.

Approved value:
Phase 1: R$ 33,970

The proposing company has been re-directing its business activities, and since 1999, has been establishing bases for the installation of a bio-factory/laboratory of bromeliads. The product to be obtained, bromeliad seedlings, will be sold on the internal and external markets. Based on the experiences observed in other countries, notably Cuba and Costa Rica, and considering the competence installed in the area within some Brazilian laboratories – and, furthermore, the research developed together

with the Physiology Laboratory of Development and Vegetal Genetics of the Federal University of the State of Santa Catarina –, the intention is to establish the basis for the working of this laboratory/ bio-factory. Bromeliads have been the most sought after ornamental plants over the last decade and the production processes on a large scale, within a laboratory, will give controlled conditions, allowing for the control of the technological processes associated with them. The main commercial applications of the research relate to the establishment of a bio-factory for the production of ornamental bromeliads, as a pilot project for the setting up of a network of laboratories specialized in the processes and products of Brazilian biodiversity.

130 Survey of the Technical Parameters for Managing a Sustainable Income from Species with Medicinal Potential, Native to the Atlantic Rain Forest

Coordinator:
Alexandre Mariot

Company:
Atlântica Assessoria Agroambiental S/C Ltda.

Approved value:
Phase 1 + scholarship: R$ 35,172.60

This survey has as its objective the evaluation of the potential for the sustained exploration of medicinal plants native to the Tropical Atlantic Rain Forest, complying with the legislation in effect, from the exploratory process to commercialization, contributing to an improvement in the local population's standard of living. In the region of the Ribeira Valley the greatest stretch of unbroken forestry cover in the Tropical Atlantic Rain Forest (TARF) can be found. The largest part of this area shows a typical forest activity, where the consequent use is restricted to management strategies for the permanent maintenance of the forestry cover. Under these conditions, the alternative of managing a sustainable income is the most viable option, balancing economic return and the conservation of nature. Initially, a survey of the plants used by the local communities in the curing and prevention of illnesses will be carried out, aiming to steer the choice of the target species of this project. Once the plants have been chosen, demographic surveys will be made in permanent forest stands, looking towards the verification of the abundance of these species and the availability of the biomass suitable for exploitation, seeking fundamental strategies for sustainable management.

131 Development of a Bacterial-Toxoid Vaccine (VT) and the Production of Immunized Yolks for the Prevention of Post Weaning Diarrhea and Edema Illness in Pigs

Coordinator:
João Takashi Ohashi

Company:
Livet Produtos Veterinários Ltda.

Approved value:
Phase 1 : R$ 47,150 / US$ 14,215

About one year and a half ago, Livet Produtos Veterinários Ltda. developed an experimental vaccine and immunized egg yolks, made from samples of *Escherichia coli* produced from fimbriae F18ab and F18ac, commonly associated with post-weaning diarrhea and with the illness named edema in pigs. Through the present project, the company intends to takes its research forward, with the production of antibodies against fimbriae antigens and VT toxin in chicken yolks (phase 1) and , afterwards, the production and evaluation of a bacterial-toxoid vaccine and immunized yolks in pigs, for the control of diarrhea and the illness edema (phase 2). Post-weaning diarrhea and the illness known as edema are, from the practical point of view, the largest causes of economic losses in pig production, and, throughout the world, pig populations suffer from different degrees of severity of these illnesses. The economic losses are significant mainly due to weight loss, high food conversion, non-uniformity of size (rejected), high medical costs and animal mortality. Current control programs are carried out using zinc oxide and antibiotics, which bring with them risks to public health. Pilot experiments in the field of experimental vaccine developed by the company Livet have shown promising results, with a reduction of up to 65 per cent of diarrhea in recently weaned piglets, showing that the vaccination and the use of immunized yolks could be an efficient method in the control of this illness.

132 Development of a Decision Support System in the Management of Reservoirs

Coordinator:
José Galizia Tundisi

Company:
Instituto Internacional de Ecologia

Approved value:
Phase 1: R$ 52,929

This project intends to produce a decision support system for the management of river basins and reservoirs, consolidating scientific experiments and management practice of these systems during the last twenty years. The project will be consolidated by an international team involving researchers from four countries: Brazil, Denmark, Spain and the Czech Republic, and which has experience of scientific research and management programs for reservoirs and hydrographic basins. The world situation of water resources, especially reservoirs (7,500 km3 stored in all of the continents), demands the organization of adequate, optimized and economic systems of management due to the economic impact produced by the deterioration of water quality and the cost of treatment and recovery of ecosystems. There is also a great need to integrate scientific research and management into one combined and compact group, which produces innovation and alternatives with economic and social impact. The decision support system will be organized beginning with the surrounding conditions that involve hydrographic basins, reservoirs, force functions, hydrological data, climatology, physics and chemistry and potential interactions with users. Manuals, courses, software for training and operation of reservoirs will be produced for environmental and waterway resource managers.

133 Projects for Odontological Implants Associated with Hydroxiapatite and Titanium Particle Coated Surfaces

Coordinator:
Bruno König Júnior

Company:
Brastec Empresa Brasileira de Usinagem

Approved value:
Phase 1: R$ 54,203

The present proposal intends to use exclusively bio-active materials or materials which promote a better interaction with bone tissue such as, for example, hydroxiapatite and titanium in particles, to be sprayed over the surface of implanted dentures, creating a greater surface contact, without the presence of contaminating residues. Titanium alloys have demonstrated high bio compatibility with bone tissue. Nevertheless part of the dental implants available on the market show themselves to be compounds containing the metal vanadium (toxic and eliminated in the urine). However, vanadium could be substituted by other metallic compounds such as niobium (non-toxic metal and found in abundance in the Brazilian territory). This alloy could give vastly superior results compared to commercially pure alloy, and is already in use in England. An increase in the contact surface between the implants and the bone tissue is also desirable. This increase can be created by means of the spraying of the surface with bio-inert, bio-tolerant, and even bio-active materials. The most commonly used material at the moment for surface spraying are particles of aluminum oxide, which belong to the bio-inert group of materials which can, partially contaminate the surface of the implants. Many implants present a format which is incompatible with that of the dental element lost, and this can lead to surface tensions which diminish or impede a perfect bone regeneration.

134 Development of a System to Increase Afocal Apochromatic Zoom for Ophthalmologic Surgical Microscope

Coordinator:
Fátima Maria Mitsue Yasuoka

Company:
Opto Eletrônica S/A

Approved value:
Phase 1: R$ 44,500

The objective of this project is to develop a system of magnification of the afocal and apochromatic zoom type to be used in an ophthalmologic surgery microscope, which is one of the products manufactured by Opto Eletrônica. This system should replace the conventional system of magnification of the Galilean type telescope that allows for only five magnifications (0.40; 0.67; 1.00; 1.50 and 2.50x). Considering the increases introduced by the lens and eyepiece, the surgical microscope has total magnifications of 05, 08, 12, 20 and 30x. With the system of increased afocal apanchromatic zoom, the surgical microscope will have available magnifications that could vary from 0.40 up to 2.50x. The optical system will consist of two positive doublets (lenses constructed of two different materials, crown or flint, the aim of which will be to minimize chromatic aberration) and two negative doublets inserted

between the positive lenses, in such a manner that the two negative doublets and one positive remain fixed. Since the relative movement of the lenses is non-linear, it will be necessary to use a sophisticated mechanical system of cams. The major advantage of this type of system is that it lends itself to the automation of the surgical microscope, making it much easier to perform surgical procedures.

135 Identification of Aromatic Compounds in Brazilian Fruit for the Creation of New Aromas for the Food Industry

Coordinator:
Claudio de Lima Miguel Martinez

Company:
VittaFlavor Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 75,546.60

The present project intends to set up a research center into national fruit, creating a data base of the aromas of these fruit. For the extraction and identification of the compounds that compose these natural aromas, it will be necessary to develop updated analytical techniques of fine chemistry, today predominantly in the hands of chemical companies. After the creation of a research center in the company, it will be important expand it and have it interact with universities, for the formation of masters and doctors in this area. Currently, research in the area of the identification of aromatic compounds is restricted to multinationals, with laboratories located in their original countries. In Brazil, there are no known laboratories specialized for this purpose. Isolated research exists in some universities for the identification of some products, but not for the creation of new aromas.

136 Spectrophotometer Based on a Pulsating Xenon Lamp and Linear Image Sensor

Coordinator:
Lídio Kazuo Takayama

Company:
Femto Indústria e Comércio de Instrumentos Ltda.

Approved value:
Phase 1 : R$ 34,563 / US$ 2,543.83

Femto Indústria e Comércio de Instrumentos Ltda. intends, through the present project, to gain the knowledge of how to develop and produce a PC-based fast sweep spectrophotometer, incorporating the most recent components and technology available on the world market. A manufacturer of spectrophotometers, the company is aware that Brazilian consumers require a product with screens and programs in Portuguese, at a price (for the product and services) compatible with national reality, in addition to responsiveness and competence in attending to their needs. New models must be continually developed, mainly to fulfill the demands and the standards of the companies with quality programs equivalent to ISO 9000 or higher.

137 Development of Equipment for the Determination of Ocular Aberrations Using Wave-Front Measurements by way of the Harmann-Shack Technique

Coordinator:
Jarbas Caiado de Castro Neto

Company:
Eyetec Equipamentos Oftálmicos Ind. e Com. Ltda.

Approved value:
Phase 1: R$ 19,500 / US$ 12,250

The objective of this project is to develop a computerized instrument for the precise measurement of ocular aberrations and associated refractive defects (astigmatism, myopia and hypermetropia). The more traditional method for refractive examinations is based on the use of various test lenses, the degrees of which vary by intervals of 0.25 diopters. This is a subjective test which leaves the patient to choose the best lens. The examination is carried out with optotypes situated a certain distance from the patient. This technique even today shows itself to be problematic when being used under certain circumstances and for certain patients. A few years ago, so-called auto refractors were developed and made available on the instrumental market. The basic objective was to eliminate the subjective element associated with previous methods. These instruments normally measure the ametropias, projecting discrete light points onto the retina. Through analysis of the reflection of these points the best corrective lens could be calculated. These techniques of conventional refractometry, nonetheless, offer no diagnosis, and therefore no treatment for irregular

features of the refractory defect. The point to point refractory map generated by a front wave analyzer collects real data from the refractometer, without simplifying it through "regular" lenses (spherical, cylindrical or toric). Consequently, the information obtained is the most complete. Since the advent of refractive surgery by excimer laser, a new field of medicine has been opened up, in which the correction of the optical defects of the ocular system can be carried out in a parametricized manner for each eye. In this way, the correction of the refractory defects with excimer laser could include the correction of optical aberrations present in the "normal" eye. Another application for the precise diagnosis of the defects of refraction is the creation of irregular corrective lenses beginning with LCD or of deformative reflector mirrors. Such applications could permit the examination of intra-ocular structures by means of specific pieces of apparatus with microscopic resolution.

138 Micro-Computerized System for the Gauging of Functional Parameters of Radio Diagnostic Equipment

Coordinator:
Newton Sá de Miranda Curi

Company:
Indústria e Comércio Fac Ltda

Approved value:
Phase 1: R$ 44,000

The basic objective of this project is to perfect a simple to operate, but nonetheless very precise piece of equipment which displays all the operational parameters of radiology apparatus, evaluating its quality in the very location itself where it is installed. Such equipment must be based on a system composed of semiconductor radiation sensors, suitably linked to a support device, a digitalized signal machine and a laptop style microcomputer, which will enable the evaluation of factors of interest, ranging from the operational parameters of the radio diagnostic apparatus (dose, kVp, exposure time, wave form, tube current, magnetic field, heel effect, semi-reducing cover) to the value of its focal point. The goal of the application of this system is in the quality control radio diagnostic equipment in hospitals, specialized clinics and even in the industrial production of this equipment for the calibration of the quality parameters. Special emphasis will be given for its application in the mammography systems.

139 Pumping System for the Extraction of Petroleum Using the Linear Tubular Motor

Coordinator:
José Roberto Cardoso

Company:
Equacional Elétrica Mecânica Ltda

Approved amount:
Phase 1: R$ 42,800

The objective of the present project is to develop a linear tubular motor for the operation of an oil pump for application in petroleum extraction systems. The goal is to offer an alternative to the traditional form of extraction, which consists of a complex system whose mechanical characteristics make extraction impracticable in low production wells or at the wells running out of crude oil. One of the characteristics of the system is that the linear tubular motor must have pulsating movement and must be designed in a modular form, facilitating underground assembly. Its choice is justified by the feature of linear movement and by the absence of mechanical contact between the fixed part (which operates) and the mobile part (which is operated), thus eliminating mechanical losses characteristic of the traditional operation. Basically the work involves three fundamental tasks: the mechanical dimensioning of the pump and of the pumping system; an electromagnetic study of the linear tubular motor, where the electromagnetic structure of the motor will be defined; the electrical calculation and construction of a prototype, simulation of the operation and thermal performance, and the development of an electronic operating system.

140 System of Video-Auditing for the Control of Vehicles in Car Parking Lots Through Images

Coordinator:
Julio Augusto Leitão Machado

Company:
Tecnima Imagem e Automação Ltda.

Approved value:
Phase 1: R$ 10,930 / US$ 3,935

The system proposes to increase the security of vehicles in closed parking lots, resolving weaknesses inherent in existing commercial systems, through

the capture of their images on entry to and exit from the car park and the emission of a receipt specific to the vehicle on entrance, in such a way that the authorization of its exit can be given either via manual (through the operator) or automatic (by computer through the application of computerized vision for the identification and automatic reading of the number plate) comparison of both images. Increases in vehicle theft have led drivers to prefer the use of controlled car parks, as they provide a feeling of security and are covered by theft insurance policy. Nonetheless, the control systems, even those automated, essentially are concerned with commercial control and don't offer protection against theft or false allegations of robbery, by failing to automatically issue receipts containing data linking the vehicle to its owner. The entirely digital processing of the images captured, as well as their storage together with the associated data (date, time and code of receipt provided to the driver of the vehicle), allows for the easy search of the images according to determined criteria. The proposed system is protected through a patent request with Registration Number MU7802291-6 at the INPI (National Institute of Industrial Property), with a view to its commercialization for owners or operators of controlled parking lots, whether paid for or free, as well as its use as a detector of stolen vehicles for highway police and traffic control agencies. Another application, also protected through a patent request with Registration Number MU7600785-5 at the INPI, consists of the automatic registration of the images and data associated with visitors and customers in banking establishments and companies.

141 Research and Development of a Low Cost Digital Network for the Automation of Buildings

Coordinator:
Luiz André Melara de Campos Bicudo

Company:
Sensis São Carlos Ind. e Com. Equipamentos Eletrônicos Ltda-ME.

Approved value:
Phase 1: R$ 23,950

Sensis aims in this first phase of the project to carry out research to define the features necessary for the design of a network control system for building automation. This network should integrate in an efficient, simple form, and at the lowest possible cost, the various sub-systems used in private or public buildings, such as: security, lighting, air conditioning, audio and video security, irrigation, telephone and Internet. Building automation or "intelligent building" is a question that has been widely discussed over the last few years. The need for the rationing of energy spent on lighting, air conditioning, among other sub-systems of a building's installations, has led to the adoption of automation as means of reducing costs. Sensis has been developing digital systems for industrial automation and, based on these developments, has turned its attention to the market of building automation. The current research will define the level of the transmission of data necessary for the transmission of commands and sensoring, as well as the group of commands for accessing all of the applicable functions available in the controlled sub-systems. From this data it will be possible to define a digital network structure of communication and protocol communication to be implemented. The network structure to be defined should be modular and of low cost.

142 Development and Classification of PET/HDPE Polymer Blends, Employing Post-Consumer Polymers

Coordinator:
Alex Sandro Babetto

Company:
Inbrapol Indústria e Comércio de Materiais Plásticos Ltda.

Approved value:
Phase 1: R$ 35,566

In this project of technological innovation, the intention is to have a blended polymer and an industrial process that permits the use of post-consumption rejects of PET and HDPE packaging, adding value to the re-cycled product, which will be in the form of PET/HDPE blends. The objective is to obtain a blend of PET/HDPE based on the use of these 100 per cent recycled polymers, or that is to say, previously used polymers so that this blend replaces in consumer products, other polymer materials that are used in virgin form. Also, there is the objective of other applications for the suggested recycled PET and HDPE such as injection processes, since currently the recycled PET is used exclusively in extrusion processes for the production of fibers and filaments, and the HDPE is used only in extrusion for

the production of wrinkled plastic and tubes for packaging. The choice of PET/HDPE is due to their large availability in both weight and volume in garbage generated by the population.

143 Development of a Low Cost Recycled PET Compound for the Manufacture of Fireproof Sockets

Coordinator:
Geraldo Pedroso Filho

Company:
Cameando Industrial e Comercial Ltda.

Approved value:
Phase 1: R$ 56,760

Cameando, a manufacturer of low voltage electrical/electronic products, proposes to study the technical and economic viability of producing fireproof sockets for florescent lamps starting from recycled PET. In order to reach this goal, it will be necessary to add functional raw materials to the recycled PET, in a double ringed extruder for the preparation of the compounds. The compositions of recycled PET will be planned out with the help of factorial projecting. The recycled PET compositions will be evaluated in a prototype product, obtained through injection. This type of prototype was chosen because of the level of geometrical detail of the mold, looking to truly evaluate the difficulties of injection molding and production. The only evaluation to be carried out on the experimental sockets will be flammability test UL94.

144 Software for the Development of Worn Parts

Coordinator:
José Bruno Neto

Company:
DuraSteel Engenharia Comércio e Representações Ltda.

Approved value:
Phase 1: R$ 48,107

Through this work, it is proposed to develop a computer program destined to follow the wear and tear of parts of a mill, with the objective of obtaining the parameters of the variables that have a direct influence on the process. Thus, there will be a starting point for the development of a multi-functional program, formulated with a base from a dynamic database from field and laboratory results, past and present, which allow the parts manufacturer to follow up the performance of his products, making possible their improvement, aiming to obtain the best cost/benefit relationship. The losses from wear and tear in the mineral industry are considerable, so much so that, for example, the refitting of the mills may represent up to 20 per cent of the cost of milling. This demonstrates the importance that must be given to the metallic consumption in milling, either in the search for better designs and materials or as well in the increase of the availability of the equipment. The forms of the worn out pieces vary as a function of their specific application – and even then, identical pieces, working side by side with the same mineral, may require different types or forms of design. Diverse methods have been developed to follow up the wear and tear of mill linings, among them that of control by the physical mapping by ultrasound and control by calibration.

8th BIDDING INSTRUCTIONS

145 Training System for Chemical and Petrochemical Processes (STOP QP)

Coordinator:
Alexandre Carlos Brandão Ramos

Company:
Laboratório de Informática Aplicada

Approved value:
Phase 1: R$ 18,000

Nowadays control centers for processing units may have two types of system. Analogical Control Systems - ACS, which use technology from the 1970s which require several operators controlling the various subsystems. And Digital Distributed Control Systems - DDCS, of more recent technology, which are micro-processed, facilitating the control and optimization of processes by computer, reducing human intervention in the normal operation of the process, intervening only when operational instabilities occur, stops and starts. The current tendency is for ACS gradually to be replaced by DDCS, in view of the great versatility of these systems represented by the interface with external computers. This ad-

vantage, however, does not favor process operators with little experience. STOP QP is there to meet the training needs of these operators, providing knowledge of corrective actions needed to resolve operational emergencies and instabilities, displaying several facilities, among which: multimedia tutorials which demonstrate the various subsystems to be operated, the function of each process and the operational procedures; interactive multimedia courses with specific knowledge tests at the end of each section and gradings for the next; simulation and visualization of the functioning of the subsystems of the processing unit in normal and emergency situations; and monitoring and timekeeping of the users actions under normal and emergency situations; accompanying the operator's learning process with graphical displays of performance.

146 Synthesis of Molecular Sieves from Carbon Precursors

Coordinator:
Aparecido dos Reis Coutinho

Company:
Multivacuo Comércio de Filtros Ltda-EPP

Approved value:
Phase 1: R$ 65,840 / US$ 5,130
Phase 2: R$ 227,090

This project aims to develop and produce a Carbon Molecular Sieve (CMS) using national, renewable raw materials (biomass), with a view to replacing the activated aluminum molecular sieve, currently imported, for use in the special filters produced by the company. The project also aims to set up a pilot manufacturing facility for the production of Activated Granular Carbon (AGC), to be used in replacement for conventional powder-form activated carbons and also to serve as a basic material for the design and building of new filter models for various applications. In phase 1 of the project it is intended to carry out work to demonstrate the technical viability of the process: the setting up of a pilot production infrastructure for the production of AGC in the company in order to embrace and establish the carbonization and activation of biomass technology developed in UNIMEP's Laboratory for Carbonous Materials (FAPESP Project Process 95/09627-6); development of the methodology of transformation of activated carbons into CMS in the Laboratory for Plasmas and Processes (LPP) of ITA; and the complete chemical and physical characterization of the products obtained (AGC and CMS) with the collaboration of third parties. The AGC developed will also be used as raw material for the production of CMS in phase 2 of the project. In the first Phase, the development of the process for obtaining CMS using plasma will be carried out using small samples produced in UNINEP. The conversion of AGC into CMS will be carried out with the creation of micropores ($d < 4$ nm) of homogeneous size to retain by adsorption specific molecules and radicals, even those of low molecular weight. The micropores will be produced by the adaptation and utilization of caged hollow-cathode cold plasma technology developed in ITA's LPFI. The anticipated effect is the blocking of meso- and macro pores produced by the depositing of carbon followed by reactivation and/or opening of narrow channels on the surface due to selective corrosions produced by the reactive plasmas. Phase 2 of the project will entail the work of setting up a complete system for the production of Activated Carbon Molecular Sieves on a pilot scale, in Multivácuo, and the consolidation of the applicability of this product in areas such as: vacuum filters in general, air filters for clean rooms and hospitals, air processor and adsorption of residual ozone in collaboration.

147 Analysis of Fatigue in Semi-articulated Trucks

Coordinator:
Carlos Alberto Nunes Dias

Company:
MASA Peças e Serviços Ltda.

Approved value:
Phase 1: R$ 35,300

Many goods vehicles, such as semi-articulated tanker trucks for the transportation of bulk or liquid cargoes, are used in Brazil for the freight of liquid and corrosive liquids. Despite being built to some Brazilian specifications and in compliance with weight regulations, owing to the state of the road surfaces these components have manifested fatigue-induced collapse, characterized by the occurrence of fracture in the region of the rear suspension bearers, causing cracks in the tanker body and spillages of corrosive products. This study will present an analysis of the phenomenon of fatigue in semi-articulated tanker trucks, taking into consideration the complex dynamic loading acting on it by virtue of tire/road surface contact. A methodology will be developed

based on the application of the SN curve in conjunction with the Palrngren-Miner rule, in order to define the accumulated damage associated with every dynamic demand, enabling a definition of the operational life of the semi-articulated tanker truck. The dynamic tensions acting on this equipment will be obtained experimentally, with the instrumentation of a semi-articulated tanker truck, and they will be recorded when it goes over a specific route. With the aid of the use of the method of Finite Elements for the definition of acting static stresses on the semi-articulated tanker truck, a proposal for possible alteration to the geometry of this component will be evaluated, with a view to reducing the stresses acting on the region of the circumferential and longitudinal solders. The idea is to suggest alterations in the manufacturing process of the semi-articulated tanker truck with the aim of reducing the defects introduced by the use of soldering the metal sheets and accessories which make up this piece of equipment.

148 Development of a Chemical Mechanism for the Controlled Release of Bioactive Ingredients for the Microbiological Treatment of the Internal Air in Climatized Atmospheres

Coordinator:
Carlos Alberto Alves de Carvalho

Company:
Scientia Tecnologia Química (ex-STQ Ind. e Com. Ltda)

Approved value:
Phase 1: R$ 74,797
Phase 2: R$ 244,150 / US$ 4,000

The principal focus of this project is in the production of a chemical mechanism for treating condensed water in air-conditioning systems, aiming for the chemical and biological sterilization of the air fed back into the internal atmosphere. The mechanism of controlled release works by the interaction between an encapsulant, cyclodextrine, obtained from a renewable source through a biotechnical process and hosts with antifungal and/or antibacterial action, forming an inclusion compound, which will be incorporated into a ceramic matrix. This is an innovative product, since it differs from other existing products on the market in its use of controlled release technology, the mechanism of which is the intelligent chemical release of the active ingredient which inhibits the multiplication of microorganisms in the condensed water and enables the maintenance of the air within the standards laid down by law. The inclusion compound will be prepared, in the laboratory phase, using the coprecipitation and liofilization methods. Aqueous solutions of cyclodextrine are mixed with the active ingredient in predetermined estequiometric proportions, in constant agitation and, when necessary, using heat, thus obtaining the supramolecular compound. The inclusion compound will be supported in the ceramic base matrix. The matrix may be prepared from ceramic dusts obtained from non-conventional chemical processes such as co-precipitation and hydrothermic, with controlled microstructure. The ceramic matrix is kept, after the controlled thermic treatment to obtain the desired microstructure, in an aqueous solution for chemiabsorbtion of the active ingredient and/or the inclusion compound, under agitation and strict pH control. The control of the stages of synthesis and the quality of the product will be carried out through physico-chemical characterization with infrared spectroscopy, X-ray difratometry, thermoanalytical techniques and nuclear magnetic resonance in solution and in the solid state.

149 Obtaining Zinc Coating and Zinc Alloys by Electro-deposition Using Modulated Current, its Passivation via Process Devoid of CrVI Followed by Application of Water-based Resin

Coordinator:
Célia Regina Tomachuk dos Santos Catuogno

Company:
Tecnozinco Tratamento Superficial Ltda.

Approved value:
Phase 1: R$ 61,800

Alloys of zinc with metals from the eighth group have been replacing layers of pure zinc in applications which require high resistance to corrosion. As with zinc coatings, zinc alloys are also chromatized with subsequent application of a layer of resin. The project in question proposes to develop layers of ZnNi, ZnCo and ZnFe electrodeposited using baths free from cyanides on a substrate of carbon steel using modulated current deposition techniques. Modulated current allows better control of the composition of the alloy deposits, as well as savings in the quantity of salts and additives used in the preparation of the baths. Subsequently, a post treatment will be carried out with alternative products to chro-

mates, such as molibdates and rare earths and, in replacement for commonly used resins, water-based varnishes will be researched. The search for alternative passivants is with the aim of bringing the products up to international standards in terms of environmental protection. The efficiency of the process with modulated current will be compared with the traditional process through reproducibility, savings on deposition time and chemical compounds, measurements of thickness of layer, the morphology of the deposit and the composition of the deposition solutions. The resistance to corrosion of passivated coatings will be analyzed with electrochemical techniques: polarization curves and spectroscopy – of electrochemical impedance and by in camera exposure to saline fog. It is intended to develop a mathematical model to quantify the protective value of Zn coatings and Zn alloys in a given medium. The performance of the electrodeposits will be compared with coatings passivated with hexavalent chrome and organic resins.

150 Design, Simulation and Development of Static Mixers for Liquids

Coordinator:
Celso Fernandes Joaquim Junior

Company:
KROMA Equipamentos Especiais Ltda.

Approved value:
Phase 2: R$ 299,380

With applications in the most varied of sectors, such as food, chemicals, pharmaceuticals, or drinks and toiletries, among others, the blending operation of shaking or mixing fluids plays an important part in industrial processes, and may be used for a variety of purposes, among which: the mixing of mixable or unmixable liquids; in the acceleration of heat exchange; to promote the incorporation of solids in liquid media; to catalyze chemical reactions; in the creation of solutions or suspensions. Many concepts of impellers have been created and studied, under a broad range of parameters, aiming, in most cases, to meet specific processual requirements. Outstanding among them are static mixers, devices set up in a line, provided with mixing elements inserted in a certain length of tube. The energy used to do the mixing derives from the pressure loss generated by the flow of fluid as it runs through the mixing elements through the action of pumping or gravity. Static mixers represent an alternative to traditional agitated vessels, being able to be used as much in batches as in, principally, continuous processes. Nevertheless, there is still a great dearth of methods which permit the presetting of specifications for the quality of mixture, in the face of technical limitations in the control of the mechanisms which govern its performance. The present research proposal aims to establish concepts for a project for the use of static mixers, optimizing them by means of computer simulation (CFD – computational fluid dynamics) and validating them by checking them against experimental data obtained on the workbench, allowing for a mathematical model to be drawn up, as well as the definition of extrapolation criteria for applications on an industrial scale.

151 Obtaining Chelated Pharmaceutical and Food Grade Amino Acids from Natural Sources

Coordinator:
César Benedito Batistella

Company:
Natural Products & Technologies Ltda.

Approved value:
Phase 1: R$ 65,980
Phase 2: R$ 209,000

This project aims to develop an adequate methodology for the production of chelated compounds from natural sources. The raw materials to be studied refer to those protein-rich compounds which come from soya, maize and wheat, among others. As a result, chelated amino acids of iron, copper, calcium, magnesium, cobalt, zinc and manganese will be obtained which can be used in replacement for mineral salts, in relation to which they present several advantages. Among them, the advantage of constituting a more natural product, displaying better absorption by the organism and being less toxic. With a quality of hygiene unquestionably superior to that of commercially produced mineral salts, these amino acids have great potential for application in the food, cosmetics and pharmaceutical industries and, naturally to compete in the export market. In addition, with a better technological content after processing, these raw materials will derive greater aggregated values when they are commercialized. The satisfactory results obtained in phase 1 of this project showed that the proposed production of high-quality chelated amino acids is totally viable. Phase 2 will complement the first phase, seeking to

overcome the technical difficulties encountered and to transform the methods already developed and made feasible into productive units. An evaluation of the products will also be carried out in terms of biodisponibility as mineral source.

152 Production and Commercialization of Equipment for the Electrochemical Removal of Metallic Ions from Aqueous Effluents

Coordinator:
Christiane de Arruda Rodrigues Ragnini

Company:
Super Zinco Tratamento de Metais Comércio e Indústria Ltda.

Approved value:
Phase 1: R$ 57,300 / US$ 4,000
Phase 2: R$ 299,519

The central objective of this project is to transform into an industrial process the process of electrochemical removal of metallic ions, developed and tested on workbenches of the Electrochemical Engineering Laboratory in Unicamp's Faculty of Mechanical Engineering. Based on the results obtained in the laboratory, it is intended to design, build and optimize electrochemical reactors with three-dimensional electrodes for direct use in the galvanoplasty industry and others which have heavy metals in their aqueous effluents. The use of the electrochemical technique for removal of metals favors the elimination, or the substantial reduction, in the iodine resulting from the physico-chemical treatment of aqueous effluents used in the galvanic industries sector. The proposal for the future is to develop and install reactors for the removal of metallic ions in every water tank used for washing so as to permit the reuse of the water in the process, as well as to minimize the amount of aqueous effluents to be treated. To this end, this project aims to design reactors which meet the demand of an industry, bearing in mind the speed at which the aqueous waste is generated and the concentration of metallic ions in those solutions. The electrochemical reactors will use three-dimensional cathodes and cation membranes dividing the hydraulic flows of the anolyte and the catholyte. In addition to the design and selection of materials, studies will be carried out on the optimization of the speed of the reaction controlled by mass transport and of the distribution of speed and pressure of the fluid on the surface of the electrodes.

153 Design and Development of Flexible Video-Endoscopic Equipment Using Fiber Optics Consistent with Use in Gastrointestinal Diagnosis and Treatment

Coordinator:
Cícero Lívio Omegna de Souza Filho

Company:
Kom Montagens Comércio Ltda.

Approved value:
Phase 1: R$ 62,500
Phase 2: R$ 288,500

Upper digestive endoscopy is a procedure which permits the mucous membrane of the esophagus, stomach and duodenum to be examined in detail and represents the most accurate diagnostic method available, with a growing range of therapeutic possibilities. Any symptom that persists or causes changes in the homeostasis related to the upper digestive tube leads to the carrying out of the digestive endoscopy. In Unicamp's Hospital das Clínicas, 12 per cent of digestive endoscopies had digestive bleeding as the main indicator for performing the examination. The most common causes are peptic ulcer and gastric and esophageal varices. The carrying out of an endoscopy is mandatory in all cases where the bleeding is significant, an endoscopic hemostasis being possible in the great majority. The endoscopic video system proposed by this project is technologically innovative in the simplicity of its structure. We will replace the rigid conventional optical systems with an appropriate fiber optic cable as a conducting element for the images to the video system. The resources available will be fewer, when compared to imported devices which offer ultra high resolution, remote control, electronic zoom, amongst others, which have grown more sophisticated in the course of the world wide spread of this type of treatment, with technological increments removed from the reality of a country like Brazil. According to those most informed on the subject, such resources add little therapeutically and make the commercial price very much higher, around US$ 39 thousand. Once developed, the equipment should popularize this type of clinical examination in Brazil, making it accessible to a larger number of doctors and clinics.

154 Recording system for Measurements of Electrical Energy Transmission of Data to the Concentrator via Communication "Carrier"

Coordinator:
Edison Ramalho

Company:
Qualibras Assistência Técnica Dirigida e Comércio Ltda.

Approved value:
Phase 1: R$ 77,000

The aim of this project is to build a system for the measurement of electrical energy consumption which is very accurate, reliable and operationally versatile, allowing for the remote programming and acquisition of data. At present, consumption figures are collected manually, generally once a month. This procedure is of low reliability and does not allow for the adoption of a considerable social gain, which would be the establishment of lower tariffs at specific times of the day, that's to say, the charging of differentiated, more socially fair tariffs. The proposed system consists of a remote module next to the electronic meter which, via communications carrier, transports the data to the concentrator terminal on the post which possesses the transformer for the area covered. From this point, via transmission through cell phone, the company's center of operations collects the data for processing. With the use of sensors on the meters, the remote module continually monitors pulses relating to the consumption of energy. This information is stored in memory units contained within the modules. The module can be accessed at any time via cell phone and the data stored in the memory units interrogated by specific man-machine commands. The centralized computer can even be timetabled to carry out an automatic sweep of all the remote modules of a given urban area and at a preprogrammed date and time. Differential tariffs based on time of day and day of the week and the month can be applied by specific programming, recorded in existing e2prom memory in the remote modules.

155 Myconate Project

Coordinator:
Eli Sidney Lopes

Company:
Indústria Bio Soja de Inoculantes Ltda.

Approved value:
Phase 2: R$ 149,963 / US$ 5,288.89

Mycorrhizas benefit plants directly because they promote an increase in the absorption of nutrients and also indirectly through other mechanisms. The increase in the absorption of nutrients is promoted by the external hyphae which derive from the internal colonization of the root system. Arbuscular mycorrhizas establish themselves in the majority of plants and they are extremely important in natural ecosystems, given that mycotrophic plants normally are pioneers in areas of low availability of phosphorus. In agro-systems, plants display good development and increased productivity, with lower doses of fertilizer than are normally recommended, when they possess good mycorrhizal colonization. Mycorrhizal colonization occurs in natural conditions by means of spores, or even hyphae which survive in root segments, left over from previous crops or natural vegetation. In the study of the mechanisms of mycorrhizal colonization it was observed that some substances, among them formononetine produced by the roots and exuded in the rizosphere, stimulate this process. Following this observation, formononetine was synthesized in the laboratory. In synthesized form it also stimulates mycorrhizal colonization and therein lies its potential for use as a stimulant for vegetal development and production. Potassic salt of formononetine also stimulates mycorrhizal colonization and could be simpler to handle than formononetine as it is highly soluble in water. The present project aims to demonstrate the agronomic efficiency of this mycorrhizal stimulant for the cultivation of maize and soya, with economic return for the farmer. It is also looking to formulate it adequately for our growing conditions. Four experiments with maize and four with soya will be carried out, with the same guidelines and treatment, with the cultivation of soya BRS 133 and maize hybrid BRS 3060. Further greenhouse experiments will be carried out to gain more detailed knowledge on the interaction of the product with varieties of maize and soya and for its application in the organic system of potato and cotton cultivation.

156 Automatic Vending Machine for the Sale of Natural Juices

Coordinator:
Enilene de França Cordeiro

Company:
Signalcard Tecnologia Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 53,376

The objective is to specify and to design an automatic vending machine for natural juices, especially orange juice. The machine will have the dimensions necessary for installation in offices, factories, schools, hospitals, etc., and one of the main features of this machine will be the fact that it won't need cleaning, a characteristic which will guarantee the quality of the product, independently from the process of distribution and maintenance of the machine chosen by the operator. The machine makes two relevant social contributions: the increase in nutritional quality for the machine users, since natural juice is going to replace alternatives such as soft drinks, and an increase in agro-business mainly as it deals with oranges in the State of São Paulo, due to the power of the capillary action product distribution in these machines. The machine may also provide an alternative in combating unemployment for the small operator, as it demands a low investment and is easy to operate. The machine will be activated by means of a magnetic card. It will be used with a pre-paid card, thus avoiding the necessity for the installation of a money machine or of an imported banknote reader.

157 A Computing Tool for the Programming of Urban Bus Routes

Coordinator:
Fernando Antônio Vanini

Company:
Fernando Antônio Vanini - ME

Approved value:
Phase 1: R$ 44,604

The project's objective is to develop the prototype of a computing tool capable of automatically generating trip programs for an urban bus route. In order to solve this problem, it begins with a curve describing the hourly demand by passengers along the route and of a grouping of operational restrictions, producing a timetable, as well as the scale of complete service of the buses and drivers/conductors that are going to operate the urban routes in question. Some software for this task is already available on the market, but the solutions found by them generally end up demanding a considerable quantity of human interventions in order to make them operational or, even worse, the computer generated solution fails to achieve significant cost reductions when compared to manually obtained solutions. This can be explained by the fact that these products reproduce the same patterns already employed in the manual construction of a travel program. The person normally involved in the development of these products has considerable experience in the operation of bus companies or in the municipal organs of transport management. However, they have little or no knowledge of computing and the development of mathematical models that can be used to tackle this problem. Thus, given the complexity of the problem, those responsible for the production of the stops fail to extract, in real time, solutions as competitive as those which could be obtained through mathematical modeling, followed by an automatic generation of produced stops using a computer tool implemented with a mathematical model base.

158 Development of Fuel Cells Integrated with Hardware and Software for Monitoring, Diagnostics, Control and Peripherals

Coordinator:
Gerhard Ett

Company:
Electrocell Ind. e Com. Ltda.

Approved value:
Phase 1: R$ 62,900 / US$ 6,000

Electrocell proposes to establish the technological consolidation of a complete package for the development of a fuel cell with the application of the concept of an intelligent system, incorporating hardware and software for monitoring, making diagnosis, controlling and simulation software, assuring greater reliability and safety of operation. This project will assure the strategic development of a project for the generation of alternative energy through the use of renewable sources, with the opportunity of technologically consolidating the generation of electrical energy based on the concept of no environmental harm, principally in urban centers, that is to say, through the use of fuel cells associated with the application of hydrogen as a fuel which results in the residue H_20, differing from the type of combustion which produces $C0_2$, the gas mainly responsible for the greenhouse effect. Fuel cells to be developed by

the company will be applicable for use in the automobile sectors, in residential and industrial buildings and as a source of electrical energy of small wattage for poorer communities and where the national electrical distribution network finds it difficult to reach. The company is proposing the development of hardware and software for monitoring, making diagnosis, control and the construction of cells of 1.2 kW fed by hydrogen, fossil fuels and fuels obtained from renewable sources. Also as part of this technological package is the supply to the market of all of the peripherals needed for the use of this source in the areas of automobiles and the generation and distribution of energy.

159 Industrial Use Electron Accelerator

Coordinator :
José Carlos Orsi Morel

Company:
Metron - Física Aplicada & Instrumentação S/C Ltda.

Approved value:
Phase 1: R$ 59,060

The present project proposes to build an electron accelerator for industrial use in the areas of petrochemicals, chemical-pharmaceuticals, foods and the treatment of effluents. With modern technology, developed nationally, and which offers reliability, reduction in costs, minimization of primary and secondary environmental impact, in addition to making the technology available to the range of small and medium businesses, which presently are unable to take advantage of it due to serious technical and commercial barriers. The use of electron accelerators in industry is fairly widespread in industrialized countries, however, it presents two serious problems. The high cost of the equipment and its maintenance and the existence of few suppliers. In addition to this, the designs of the machines are of an old conception – the majority of their patents are from 25 years ago –, they are not very efficient and they consume a great deal of energy, which has hampered the spread of the technology in Brazil. The industrial base, however, would benefit greatly from a broad dissemination of this technology, from the point of view of saving foreign currency and the improvement of environmental conditions, as well as the expansion of the possibilities for research and development of new materials, such as, for example, technical packaging, the insulation of electrical cables for applications in the automobile and aeronautical industries and the cure of adhesives, varnishes and paints on different substrates. The proposed machine aims to generate extended electronic fluxes, of high current and moderate energy. The undertaking is divided in three phases. The first is the development of a workbench experimental model, containing the fundamental elements of the project in order to demonstrate the technical-commercial viability . The second phase involves the construction of a prototype with all the elements of the final equipment and which will enable the evaluation of its operation within a realistic industrial environment. The third phase will consist essentially of transfer of the technology generated to an industrial base contemplating the mass production of the items developed in the present project and the development of national suppliers for its accessory items.

160 Development of a Polymeric System for the Transmission of Light

Coordinator:
José Miraglia

Company:
Light Tech Ltda

Approved value:
Phase 1: RS 75,000

Polymeric systems for the transmission of light, offer several advantages compared to glass optical fibers. Attempts to use the latter for general or specialized lighting have been quite difficult, because these fibers are expensive, fragile, heavy, have a small diameter and do not transmit a large amount of light under normal conditions. It is clear therefore, that there is a need to find a cheaper, more flexible, longer-lasting light source for lighting. And concomitantly, to create polymeric fiber optics resistant to ageing, even when exposed to heat of up to 350°C at the point exposed to the light and up to 250ºC in the rest of the length; which offers characteristics such as good environmental resistance and good light transmission property; does not go out of shape with age, does not melt, oxidize or deteriorate when exposed to high temperatures, remaining flexible; and which, besides this, is relatively easy and cheap to produce. It is intended to apply the technique of radiation-induced polymerization to the system composed of methyl methacrylate monomer base, mixed with

other components to lower the Tg and increase the flexibility with the aim of: 1) achieving fine control over the reaction, since radiation polymerization permits greater control of the process, given that the energy can be delivered directly to the reactive mass without problems of heat transmission; it is possible to initiate the reaction at any temperature, which allows for control of every stage, from beginning to end; and 2) the absence of color, since radiation dispenses with the use of radicalar indicators. Radiation makes it possible to attain higher conversions than in any other process, eliminating the presence of monomers that might post-polymerize.

161 Fluorescence Spectrophotometer with a Double Monochromatic System of Continuous Sweeping, Based on a Xenon Pulsating Lamp

Coordinator:
Lídio Kazuo Takayama

Company:
Femto Indústria e Comércio de Instrumentos Ltda.

Approved value:
Phase 1: R$ 52,963 / US$ 4,379.20
Phase 2: R$ 131,000

In keeping with the world wide trend, the use of the spectrophotometer in Brazil has been growing in volume and importance in the pharmaceutical industry, molecular biology laboratories, environmental control, limnology and the food industry, following on the heels of a worldwide trend. It also can be applied in medicine for hormonal analysis and the demarcation of cancer, in the petrochemical industry and in the analyses by chemo-luminescence and bio-luminescence. Femto's objectives in this project are: 1) the development of a fluorescence spectrophotometer with double monochromatic system of continuous sweep, based on a xenon pulsating lamp; 2) knowledge and use of the program Optical Design Software ZEMAX -EE(ID) to be applied in the calculation and the optical project; 3) development of a high speed acquisition system with the resolution of 12 bits or better, with a conversion index less than or equal to 20 ms.; 4) compensation of the signal by means of the reference beam and synchronization through the xenon lamp. Temporization of the A/D converter should be carried out preferably by the micro-controller 8031, and if this is not possible it will be necessary to develop an alternative system; 5) development of software in high level language (Delphi); implementation of methods: PC-type Microcomputer based on a 32-bit operating system (Windows 95/98 or above). The potential national market for fluorescence spectrophotometers with the characteristics described above is estimated by the company to be around 40 units per year, which equates to R$ 2.4 million.

162 System of Automatic Measurement of the Cornea's Curvature Rays with a Slit Lamp - Automatic Keratometer with Slit Lamp

Coordinator:
Liliane Ventura Schiabel

Company:
CALMed Ltda.

Approved value:
Phase 1: R$ 53,545
Phase 2: R$ 163,333

The basic objective of the present project is the development of a piece of equipment for clinical use which is simple to operate, but automated and precise, which offers measurement of curvature rays of the human cornea, or rather, automatic keratometry. This equipment will be adapted to the Split Lamp (ocular biomicroscope available in all ophthalmological clinics), and which will be able, at low cost, to carry out quickly the measurements described above. The system consists of capturing the reflection from the projection of a luminous ring sight in the patient's cornea, through an optical system and a detector of the CCD type. The image of this reflection is sent to a PC type microcomputer via a video capturing board in real time. The image is analyzed afterwards by a computer program which will provide the rays of greater and lesser curvature and the respective associated axes, of the analyzed surface, in relation to the deformity of the reflected image of the ring. In Brazil, manual and automatic equipment exists for keratometric measurements, but it is all imported and expensive. The system proposed here offers, in addition to speed of obtaining measurements and the presentation of the final results, depth of scale up to 30D, precision in ray of curvature and axis comparable to manual keratometers, respectively, the advantage of low cost. Phase 1 of the project may be considered a success, in view of the enormous interest of other com-

panies in the sector in commercializing the equipment and/or obtaining patent licenses. Thus, in order to cater for clinical needs and market interest, phase 2 will consist of perfecting the system with an LED and also it will be miniaturized.

163 Development of Photo Conductive Cones for the Obturation of Canals with Photopolymerizable Obturating Material

Coordinator:
Luis Augusto Lupato Conrado

Company:
Goen3 Comercial Ltda.

Approved value:
Phase 1: R$ 41,740 / US$ 10,412.45

Root obturation aims at the complete sealing with materials which, through their own properties, aid the repair process. In view of the large number of endodontic failures, various studies have been carried out aiming to optimize the sealing of the root canal. Gutta-perch cone is the solid material most commonly used nowadays for this purpose. This material, however, is unable to fill all the voids previously occupied by the pulp, requiring professionals in the field to use various cements and pastes to cure this problem. Owing to the fact that the endodontic cements used present polymerization by chemical reaction, paste-paste, or even dust-liquid, a mechanical contraction can be observed with consequent infiltration next to the wall of the root canal. On the other hand, photopolymerized cements display qualities superior to those chemically activated, but they are not indicated for endodontics owing to the difficulty of guiding the light to the apical region. The possibility of guiding laser light by optical fiber to the apice permits the testing of the apical sealant using photopolymerizable cements. Faced with the difficulties imposed by a common optical fiber for this type of application, a solution adapted to this kind of optical device was sought. It involves the design for creating a photoconductive cone capable of distributing optical radiation along the whole length of the root canal. For the construction of this device the characteristics of different biocompatible polymeric materials will be studied, for subsequent development of the process of obtaining the cone. The implementation of this device will enable the complete sealing of the root canal with the help of photopolymerizable cements, allowing for the replacement of the traditional gutta-perch cone.

164 GPS Receiver

Coordinator:
Marco Antonio Chamon

Company:
Navcon - Navegação e Controle Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 61,010
Phase 2: R$ 154,500 / US$ 31,500

The enormous growth in the application of Global Positioning Systems (GPS) is generating the need for the mastery of this technology, not only for applications, but also for the adaptation of the project of receptors for specific needs. This need has become greater in view of the progress in the area of low cost inertia sensors, leading to a growth in the use of integrated GPS/ Inertia systems. Today this is an area of major development in positioning systems in every developed country, and even in some emerging countries. The company, in collaboration with researchers from the National Institute for Space Research, Inpe, is attempting to follow this trend, through carrying out a project developed within the ambit of PIPE named Integrated GPS/Inertia Platform, now in its final phase. As a natural follow-on, the project now proposes to look into the development of GPS receptors based on available chips sets. The objective is, through the mastery of the project's techniques, to eliminate restrictions imposed in the use of the receptors in applications of greater altitude and speed, such as space, as well as to permit an improvement in the use of the techniques of integration with inertia sensors and others. The restrictions mentioned previously are not found in the chip set used for the receiver, but in the software firmware which determines the dynamic of the tracking coverage of the satellite signals and, therefore, the capacity to track a vehicle with greater velocity and acceleration, and in the application software which determines the vehicle's coordinates. This software can be altered once the algorithms involved are mastered. The possibility of using a GPS receiver with several aerials, or several GPS receivers for the determination of altitude received a great boost recently when it became possible to obtain greater precision from the systems using low cost inert sensors,

through their operative calibration. In a project developed by the previously mentioned company, this last option was used. By means of access to the design of the receiver, consideration of the second option becomes a possibility, particularly for space applications, in which the reduction in weight and energy used is more important than cost.

165 The Establishment of a Metrological Standard for an Audiometric System with Parameters for the Respective Functions of Calibration and Reliability

Coordinator:
Oswaldo Rossi Júnior

Company:
Inter-Medtro Serviços Especiais e Consultoria Ltda.

Approved value:
Phase 1: R$ 5,500
Phase 2: R$ 77,480

The carrying out of an audiometric evaluation is extremely important in the process of diagnosing individuals suspected of having a hearing problem. Electronic equipment called audiometers is used for this purpose. However, two factors conspire negatively to influence and drastically undermine tests carried out in this country. The first is the lack of a national standard for the metrological reliability of the equipment, along with the occurrence of a very large number of diverse equipment and distinct methodologies. Secondly, the lack of standardized parameters and metrological standards for these pieces of equipment. The central objective of the present project is to develop research and define stable standards for the operating of audiometric stations in their diverse configurations, as well as standards for the metrological reliability of these stations. It is about developing a brand new and reliable system of measurement for analysis from audiometers with characteristics such as operational agility and portability that may be removed from the metrological laboratory to clinics and locations where audiometric tests are being carried out. In this way, the system will be able to carry out readings and measurements in a simple manner and in real conditions. The readings effected will be stored in electronic memories (loggers) and sent to the laboratory for analysis and the definition of the metrological characteristics of the instrument previously measured. The implementation of this project should significantly reduce the time and total cost of the calibration of audiometers, permitting the metrological laboratory to function far from its base, while nevertheless maintaining a high degree of reliability in its measurements.

166 Development of a Tar Based Resin with Enhanced Properties for Use in the Graphics Industry

Coordinator:
Paulo Firmino Moreira Junior

Company:
Angatuba Química Ltda.

Approved value:
Phase 1: R$ 40,100
Phase 2: R$ 233,800

The objective of the present work is to design a process for the production of resins with enhanced characteristics for use in the graphics industry which are in the public domain or innovatory, and the product of which possesses properties appropriate for use as a pigment vehicle in off-set printing presses. Brazil is the world's second largest producer of tar. However, the national industry does not add sufficient value to this raw material, which is exported and later imported back in the form of finished product. Currently the company also produces tar based resins with a low added value due to the use of an outdated technology. The project includes the drawing up of a bibliography involving the study of patents and papers for the selection of possible routes of synthesis for the definition of raw materials to be used in the second stage. Trials are also planned in the Analytical Center of the Chemical Institute of the University of São Paulo, USP, and reactor bench trials in USP's Department of Chemical Engineering with a view to obtaining a first selection of process conditions, including in this operating conditions (temperature and pressure) and the proportion of reagents to be fed in with the aim of synthesizing a resin with the desired characteristics, enabling an assessment of the technical-economic viability of the synthesis. In the second phase, in addition to the development of tar based resins with enhanced properties for use in the graphics industry, the implementation of a structure for the engineering of tar based products will be emphasized.

167 The Production of Amino Acid Chelates from Hydrolyzed Proteid of Saccharomyces cerevisiae to be Used as Mineral Food Supplements of High Bio-Availability

Coordinator:
Ricardo da Silva Sercheli

Company:
Biofarm Química e Farmacêutica Ltda.

Approved value:
Phase 1: R$ 61,840
Phase 2: R$ 216,190 / US$ 255,275.20

The goal is to develop processes aimed at the industrial production of chelates of amino acids obtained through complexation reactions between different metals and the hydrolyzed proteid of *Saccharomyces cerevisiae*. Stage 1: Hydrolyzed proteid of *Saccharomyces cerevisiae*: though amply described in technical literature, the research intends to develop an industrial process capable of obtaining a hydrolyzed product of the necessary quality to be used in the next stage, at a competitive operational cost, avoiding the generation of effluents. The two selected processes for the study were that of acid hydrolysis and of enzyme hydrolysis: a) acid hydrolysis: the work will initially concentrate on the parameters described in the literature, aiming for an optimization of the process in relation to the different acids used; b) enzyme hydrolysis: will be conducted in the presence of a mixture of proteids, initially following the data described in the literature for posterior determination of the operational parameters of the process. The choice of the best process will be made based on the quality and cost of the hydrolysis obtained. Stage 2: amino acid chelates. These will be obtained by adopting the following steps: a) the formation of organo-metallic complexes; b) desalinization of the mother liquid of the reaction and the isolation of the product; c) the drying of the complex. Phase 2 of the project will seek, taking into account the results obtained in phase 1 and works described in the literature, to develop processes aimed at the industrial production of free amino acid chelates and peptides obtained through complexation reactions between different metals and the hydrolyzed proteid of *Saccharomyces cerevisiae*. The proposal is to obtain a hydrolyzed proteid containing peptides with a molecular weight of half 1 million daltons, which offer high absorption for the organism.

168 LF Line Project

Coordinator:
Vicente de Paula Barbosa

Company:
Lifemed Industrial de Equipamentos e Artigos Médicos e Hospitalares Ltda.

Approved value:
Phase 2: R$ 173,947 / US$ 7,400

The vast majority of infusions are performed by gravitational means, an inadequate method in view of the need for constant readjustments in the flow as the level of the liquid to be infused decreases in the feeder bottles as the infusion progresses. With the introduction of new, more concentrated and powerful drugs, requiring stable and precise flow for the safety of the patient and the medical profession, so-called mechanized infusions have emerged. These use micro-processed electro-medical pieces of equipment which control in a precise and constant manner the amount of medication injected. During these sessions, the infusion line must be monitored for the presence of air to prevent patient embolism and also the occurrence of excessive pressures which could cause a break in the line or in access to the circulatory system. In addition to this, medical staff need to be alerted by the equipment via its alarm systems in case the medication runs out or the line in becomes obstructed. The proposal for this project is to develop items of equipment essential for the medical practice of life support. The equipment set brings together the following features: 1) a linear peristaltic pump – the first such equipment to be manufactured in Brazil using national technology; 2) an "air-in-line" detector using proportional ultrasound; 3) non-invasive infusion line detector; 4) activation of system peristaltic linear system by means of a micro-controlled stepper motor with variable torque; 5) anti-free-flow device which cuts off the flow; 6) infrared system for the detection of dripping and end of infusion; 7) patient alarm and protection systems; 8) interactive user communication and programming via LCD; and 9) micro-controlled automatic test routine for detectors and audible and visual equipment signals.

169 Thermo-chemical and Plasma Treatment of Carbon Steel Reels

Coordinator:
Vladimir Henrique Baggio Scheid

COMPANY:
Metal Plasma S/C Ltda

Approved value:
Phase 1: R$ 21,710 / US$ 2,115

Nitration by plasma is a process used for the improvement of various physical properties of steels such as hardness and resistance to wear, corrosion and fatigue. This process consists of a luminescent discharge of gases at low pressure containing nitrogen. The plasma makes use of nitrogen atoms that permeate into the steel to form nitrides of elevated hardness. In this process there is no formation of pollutant residues. Especially in the case of carbon steels, the nitration favors a definite and long lasting protection against corrosion. The objective of this project is to develop a process for the treatment of carbon steel reels through their cleaning and nitration by plasma, with a view to protecting them from corrosion. The intention is to develop the process and to improve on the parameters in order to reach a compatible cost and higher standard of quality than those offered today by galvanoplasty. It is also proposed to carry out market research among the large suppliers and users with the aim of evaluating the demand and the requirements of each line of production. Though commercial equipment exists, capable of processing a large quantity of material, it is not appropriate for the treatment of reels of sheet metal and wires, since only the external parts of them, which are exposed to the plasma treatment, are nitrated. The present process, using an innovative system, would permit the nitration of long reels of wire. Its development will enable the company to increase its area of activity and will also bring socioeconomic benefits, both from the environmental point of view and in the generation of new jobs.

170 Finished Polyether Silil-based Adhesives and Sealants for use in Industry and Civil Engineering

Coordinator:
Wang Shu Chen

Company:
AdEspec Adesivos Especiais Ind. e Com. Import. e Export.

Approved value:
Phase 1: R$ 44,830 / US$ 3,690
Phase 2: R$ 291,000

This project seeks to develop finished polyether silil-based adhesives and sealants for use in industry and civil engineering. This involves an important technological innovation in the science and engineering of polymeric materials, since they have adhesive properties equal to or superior to silicone and polyurethane adhesives in almost all substrates used in industry and civil engineering. Unlike other types of adhesive, they are free from solvents and isocyanates, being, therefore, harmless to the atmosphere and to the health of workers. They also form resistant and quick-setting bonds, which should encourage new production methods in industry and civil engineering. The project will determine the formulations which best suit the needs of the national market for adhesives and sealants. The physico-chemical properties of the formulations obtained will be optimized and compared with silicone and polyurethane based products currently used on the market. At this stage, the basic production processes of the most suitable formulations will be determined and tests carried out in pilot batches using potential customers. Once the product and process parameters have been defined, the intention is to produce and commercialize those products which demonstrate the best cost-benefit relationship and market potential.

9th BIDDING INSTRUCTIONS

171 Development of Expander Agent Based on Aluminum Slag for the Production of Autoclaved or Molded Cellular Concretes in loco

Coordinator:
Edval Gonçalves de Araújo

Company:
Siporex Concreto Celular Ltda.

Approved value:
Phase 1: R$ 72,700
Phase 2: R$ 300,163

Secondary slag from the production of aluminum contains, in addition to oxides, salts and other compounds, around 3 to 5 per cent of metallic aluminum. After processing the slag, the removal of the salts takes place and a powder is obtained with a granulometry below 150 micrometers. The resulting material contains aluminum metal finely spread and

homogeneously dispersed. When exposed to the alkaline medium, it releases hydrogen and can be used in the production of cellular concrete. The experiments in this project aim to determine the properties of autoclaved cellular concrete with the addition of slag as a gas forming agent (apparent dry density – NBR 13440 – and resistance to compression – NBR 13439), maintaining the same industrial conditions of the processing. Concrete not autoclaved with slag, will be tested for the action of stabilizers and tensoactives on the resistance to compression of concretes with a density of 800 to 1600 kg/m^3 (NBR 5739). Thus, this project is based on the reuse of a highly polluting industrial waste in the production of cellular concrete. In financial terms, this technique represents a viable alternative for the replacement of common expanders (aluminum powder or foaming agents), decreasing in up to 10 per cent the cost of raw material used in the manufacture of these two types of concrete.

172 Instant Whole Bean: Study of the Critical Conditions in the Process

Coordinator:
Franz Salces Ruiz

Company:
Green Technologies, Projetos Agroindustriais S/C Ltda.

Approved value:
Phase 1: R$ 17,991

Owing to the complexity of modern life, the spread of so-called convenience products – foods which combine speed with ease of preparation – has become ever more widespread. The development of instant whole beans was based on growing demand from that market and considering that Brazil is the world's leading producer and consumer of this important legume. Instant beans benefit from the high availability of excellent quality raw materials, easily adaptable technology, low energy consumption and high yield. In view of this, to industrialize this type of bean, technico-economic viability studies are needed. Based on the methodology described in the product patent's technical statement, the objective of this first phase of the project is to determine the critical conditions of the parameters in the unitary operations considered most important in the process, in the maceration with mineral salts and in the high pressure heat treatment. The study of these conditions of this process will allow a technical evaluation to be undertaken and, subsequently determine the economic viability of the project.

173 Safety Culture in Activities Involving Ionizing Radiation

Coordinator:
Gian Maria Agostino Angelo Sordi

Company:
Átomo Radioproteção e Segurança Nuclear S/C Ltda.

Approved value:
Phase 2: R$ 250,400 / US$ 895

The company offers radioprotection services in the field of ionizing radiation applications in industries, in the area of medicine and in research, among other sectors. To achieve part of its objectives, Átomo developed an educational sector which, among other products, provides interested parties with the minimum knowledge that a specialist in radioprotection or a worker should have, in the presence of ionizing radiation, to carry out their tasks with safety. The learning system currently in place amounts to an exposition by the instructor and the clarification of the pupil's doubts, which, in addition to being expensive, removes the specialized professional from the workplace for a minimum of five weeks. The objective of this project is to develop a low cost multimedia course, which can be followed at a distance, with or without the presence of an instructor, in a group or individually. The course could have different degrees of complexity, that's to say, it could be accessed by the simplest or the most sophisticated pieces of equipment. The company's mission, in this business, is to offer flexibility of solutions, using techniques which afford the least physical and emotional wear on the professional, as well as lower costs for the business that uses them.

174 Malleable Pleated Valve with Self-Adjustable Flow Mechanism for Pleural or Mediastinal Drainage Collection System

Coordinator:
Hugo David Chirinos Collantes

Company:
Roberto de Menezes Lyra ME.

Approved value:
Phase 1: R$ 47,000
Phase 2: R$ 140,000

At the moment, public hospitals in remote parts of Brazil use systems for pleural and mediastinal drainage which are fashioned by the surgeons' own handicraft. These systems can cause serious complications in the patient's convalescence, raising the risk of hospital infections and of post-operative sequels. On the other hand, the systems for pleural and mediastinal drainage with a simple or single collecting bottle, manufactured on an industrial scale in Brazil, promote improvement in the quality of hospital care, at a relatively low cost when compared with international products. The innovation in this product is a malleable pleated valve with a siphoning mechanism self-adjusting for flow. At a low cost, this product adds technology to the system for pleural and mediastinal drainage with a simple or single collecting bottle, making it more competitive technologically. This valve will optimize the variations in subaquatic pressure drawn off by siphoning the gases coming from the thoracic cavity, in the collecting system. In the technical viability stage of the project, the matrices and the manufacturing processes for the pieces that make up part of the drainage system were developed. In the second phase, the manufacture of the pleated valve which is part of this system will be optimized, concentrating on the choice of materials which are totally sterilizable by ionizing radiation.

175 Production and Characterization of Environmentally Degradable Polymers (EDP) From Renewable Sources: Sugar Cane

Coordinator:
Jefter Fernandes do Nascimento

Company:
PHB Industrial S.A

Approved value:
Phase 1: R$ 54,360
Phase 2: R$ 284,480

Poly(3-hydroxybutyric acid) or pl-113 is an environmentally biodegradable polymer, synthesized and accumulated as a reserve substance by a series of bacteria, with thermoplastic properties similar to those of conventional polymers. However, it manifests the peculiarity of being highly biodegradable when exposed to biologically active environments, which makes it very attractive in refuse situations in the environment. This polymer is also biocompatible, with a high regularity of polymeric chain and high molecular weight, which permits numerous industrial applications, including flexible packaging (films), rigid packaging (blown bottles, plastic bottle tops and thermoforming sheets) and surgical components, among others. The biodegradable plastic PHB (polyhidroxibutirate) synthesized by biotechnological production is extremely competitive commercially, since starting with cane sugar, with the stages of synthesis, extraction and purification of the polymer with natural solvents, a final product with a very low cost is obtained. The present project aims to launch this product on the plastic packaging market. In order to characterize and formulate the polymer, it will be necessary to acquire some basic equipment in polymer technology which will go towards complementing the investments already made by PHB Industrial S/A in this project.

176 Production of Pre-alloyed Metal Powders by Atomization for Application in the Manufacture of Tablets for Addition of Alloying Elements in Aluminum Metal Baths

Coordinator:
Lucio Salgado

Company:
Mextra Engenharia Extrativa de Metais Ltda.

Approved value:
Phase 1: R$ 73,600
Phase 2: R$ 300,000

The addition of alloying elements in metal baths can be achieved using carriers contained in the mother alloys obtained by smelting or, as is becoming more widely used, by means of powder mixtures, in the form of tablets or briquettes. In the specific case of aluminum alloys, normally mixtures of aluminum powder are used with powders of the alloying element one wishes to add, such as iron, chrome, nickel, copper, manganese, etc. These tablets must perform well in the dissolution of the alloying element, that is, they must provide a good yield so that as much as possible of the alloying element is incorporated into the liquid aluminum. This project aims to develop the process for manufacturing powders of metal alloys by water atomization, the main purpose of which is the pro-

duction of these tablets. The idea is to add value to the tablets by means of manufacturing a powder with the final desired composition, normally in the range of 70 to 90 per cent of the alloying element (the remainder aluminum), which could minimize or dispense altogether with the use of elemental powders. In phase 1 of the project the atomization parameters were defined for the preparation of the metal alloys. Phase 2 is planning to install an industrial unit with capacity for the production of 200 tons per month of the Fe-10%AI alloy. In this phase, studies will be carried out to optimize the manufacturing process of the powder and the tablets.

177 Interphone Communication System via Electricity Network

Coordinator:
Manuel Bernardo da Silva Neto

Company:
EQE - Eletrônica Qualificada Espacial Ltda.

Approved value:
Phase 1: R$ 35,120

The central aim of this work is to validate the concepts and ideas for the development and implementation of an interphone system for condominium environments using the electric cabling as a means of propagating the voice signals. In this way the need for the installation of a specific new medium for communication between the terminals is dispensed with, as is the need for a central routing unit. The basic objective is to make available a solution to meet the needs of users who do not have an efficient means of communication amongst themselves, or which represents an important safety item. Or to cater for those who live in environments where the installation of currently available systems is difficult or costly. Technically each interphone will be an independent terminal, capable of entering or leaving the network environment without impairing it. To guarantee secrecy and reliability in the communication or in the establishment of the link, some sort of spectral diffuser will be used, adding to this product a modern technology, which will allow for an expansion of functions. We will also make available a low cost, flexible and secure alternative means of closed network communication.

178 Control Network of Devices with Distributed Intelligence with Voice and Data Communications Interfaces with Public Exchange Telephone Lines, Applied to Residential, Commercial, Industrial Automation

Coordinator:
Miguel dos Santos Alves Filho

Company:
Conceito Tecnologia Ltda.

Approved value:
Phase 1: R$ 56,273
Phase 2: R$ 121,035

The fundamental objective of this project is to demonstrate and implement a new applied technology in telephony. This technology distributes intelligence and autonomy through a communications network by means of interfaces for the participating telephonic circuits of any telephone system to share and inter-relate all the internal and external states to be controlled by a communications network specially developed for this purpose. The technology displays high performance, with speed in the interoperability of all the components of the network. In addition, the control of the process is entirely decentralized. Each active element or sensor works independently while being at the same time integrated to the other devices present in the network. The main advantage of the system is low amount of wiring and cabling and it can be applied in a modular manner, decreasing maintenance costs. Telecommunications, residential automation, commercial and industrial sectors are the targets initially envisaged for the application of this system. The present project is studying the methodology and modeling for the development of any control system based on the concept of distributed network control, in any field of application.

179 iGate - Gateway with Direct Connection to the Internet

Coordinator:
Marcelo Tadeu Bertanha

Company:
IAS - Integração e Automação de Sistemas Ltda.

Approved value:
Phase 1: R$ 51,936 / US$ 1,200
Phase 2: R$ 184,145.29

This project entails the development of a piece of hardware called i-gate, the function of which is to collect field variables such as level, temperature, flow, pressure and other so-called field variables. The hardware connects directly to the world wide web uploading information there into a database, accessed by software developed for the internet environment. I-gate will have the main capability of monitoring up to eight field variables, isolated from the existing measuring provision, with a weatherproof cabinet, and two digital input and output connections. The main benefits envisaged derive from the use of the existing web structure, rendering unnecessary a structure for receiving the information, or a Datacenter. With a local connection to an internet service provider, long distance calls will no longer be necessary. Equipment imported today does not have a direct connection to the internet. I-gate, presently, is applied in the Remote Monitoring of Tanks for the supply of grain. The product supplier receives information regarding levels in the tanks via internet, from his customer, and carries out a Planned Product Delivery, based on demand, production, transport conditions and other parameters.

180 Application of Parallel ComputingTechniques to the Solution of Problems in the Logistical Optimization

Coordinator :
Nelson Bianco Standerski

Company:
Paperless Consultoria e Serviços em Sistemas de Gerenciamento de Informação Ltda.

Approved value:
Phase 1: R$ 7,500
Phase 2: R$ 22,460

The project aims to develop a set of software tools for application in large scale problems of logistical optimization, using parallel processing techniques. The first phase seeks to demonstrate that the algorithms of parallel processing can be successfully applied in this area, in the typical operating conditions that exist in Brazil. The generation of the programming of deliveries/collections in the case of a large number of places of origin and destination, freight with different characteristics, large and diversified fleets of vehicles and the needs of replenishing stocks is a large scale inventory routing problem. Parallel programming can help in its solution, reducing processing time and improving the quality and stability of the results. A parallelized algorithm model will be implemented (own code/optimization solvers), parameterized for the number of CPUs. The computational architecture used will be a workstation with various processors, compilers and a set of optimization solvers. In the second phase, complex operational restrictions will be incorporated such as, for example, a large number of products, different packaging, different vehicles and time windows for collection and delivery. Optimization of stock replenishment will also be modeled, aiming to program deliveries/collections so as to simultaneously optimize transport costs and stock costs.

181 Development of a Low Cost System for the Generation of a Differential Correction Signal, in Real Time, for GPS

Coordinator:
Nelson Luis Cappelli

Company:
DLG Automação Industrial Ltda.

Approved value:
Phase 1: R$ 39,145
Phase 2: R$ 226,470

This project aims to develop a low cost system for generating differential correction signals for GPS (global positioning system) in real time, with radio-frequency transmission and use of a private correction station. For the development of this station it is intended to use a GPS receiver of the portable type to generate the correction signal. GPS is, at present, the most widely spread and used global positioning system. Low cost GPS receivers, used by civilians, currently display an inaccuracy of 15 meters in horizontal positioning. To improve the GPS accuracy, so-called “differential correction” can be used, this being the system known as Differential Global Positioning System (DGPS) or differential GPS. The functioning of DGPS is based on the supposition that the error in determining a point is similar for all the receivers situated in a radius of up to hundreds of kilometers. The elimination of this error allows the user to significantly reduce the total error present. With the use of differential GPS the precision in positioning can increase up to submetric figures. It will be necessary to develop a piece of equipment that will receive the GPS positioning signal and transform it into correction signal in the appropriate format.

182 Industrialization of Biodegradable Starch Films

Coordinator:
Olivier François Vilpoux

Company:
Empresa de Materiais Biodegradáveis Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 44,115
Phase 2: R$ 151,200

The project aims to identify industrial equipment and the adaptation of biodegradable starch films to enable their large scale production. The intention of Empresa de Materiais Biodegradáveis (EMB) is to produce biodegradable matter based on starch and other materials of vegetable origin. Starch film is already suited to niche markets such as edible wrappings (sweets, candies and toffees) or for packaging of products to be dissolved in water (detergent, defensives and chemical products). However, the equipment for the manufacture of disposable plastic films on the market has not adapted to the starch film, mainly as it uses cooling for hardening, while the starch demands a drying process. As well as the differences in the processing stages, the raw material that gives origin to the starch film has a consistency different from the plastic one, making the process of blowing and film formation difficult. In the first phase of the project, in which work was done on the identification and evaluation of possible equipment that could be used for the formation of starch films, among other activities, problems were uncovered that need to be solved in the second stage. The intention is also, in this phase, to carry out impermeability tests on the products and on the materials obtained from EMB's pilot equipment, in addition to working on the improvement of the mechanical properties of the film, and on the preparation of a detailed business plan.

183 Project for Monitoring Equipment for Gastroesophagal Reflux Disease (DRGE) with Innovative Use in Biliar Paths

Coordinator:
Paulo Sakai

Company:
Ibasil Tecnologia Ltda

Approved value:
Phase 1: R$ 42,360

The creation of solutions for the diagnosis of gastroesophagal reflux diseases (DRGE) is the origin of the present proposal. Studying the clinical manifestations of these diseases, physiological aspects of the human body and the digestive process, the search is for technological concepts for the monitoring of esophagal reflux and esophagal motility. The idea is to develop a piece of equipment which, by means of a probe inserted in the esophagal cavity, parameterizes the physical modification in the region during a determined period. The probe will store the alterations of the pH and the pressure exerted by the esophagus musculature, which will be transferred to a piece of software which will interpret in numbers, graphics and statistics the data collected, comparing it with pre-established data. This measuring apparatus should reach a broader range of pH reading, making it possible to identify the origin of the reflux. The probe should have multiple sensors, which will permit more accurate and faster monitoring. In the reading of manometric pressure, for example, the multiplicity of sensors will be better at interpreting the sequences and pre-established standards of the behaviors of the esophagal motility. Owing to the cost of imported apparatus, the pH/manometric examinations are not very widespread in Brazil. The production of a national apparatus, at an accessible cost, will bring great social benefits to the country.

184 Preparation of Magnesium Hydroxide as Antiflame in Polymers

Coordinator:
Pompeu Pereira de Abreu Filho

Company:
Itatex Indústria, Comércio de Cerâmica Ltda.

Approved value:
Phase 1: R$ 54,823 / US$ 7,995

The project involves the development of an original chemical process for the preparation of magnesium hydroxide to be used as an antiflame product in polymer compounds. The starting materials will be commercially available natural magnesite or caustic magnesite (MgO). If the starting material is magnesite, the chemical process will entail its thermic decomposition using formed briquettes with hollow perforations in one of their extensions and prepared mixing magnesite and water, in the presence and in the absence of an organic agglutinant (dextrine). These briquettes must be mechanically resis-

tant to withstand the manipulations and contraction stresses during thermal treatments. The magnesite briquettes will be transformed into caustic magnesia by thermal decomposition (between 600-800ºC) in an oven with forced air renovation and, immediately, ground to obtain caustic magnesia in the form of powder. If the starting material is commercially obtained caustic magnesia, the chemical process will not include the stages of briquetage and thermal decomposition and will begin at the hydration stage. In this stage, the caustic magnesia in the form of powder will react with water vapor in the interior of a reactor built for this purpose. The reaction of the caustic magnesia plus the water vapor producing magnesium hydroxide will be monitored using thermogravimetry and/or x-ray diffraction to determine the fractions of magnesium hydroxide formed and caustic magnesia remaining during the reaction process. The starting materials and the magnesium hydroxide will be characterized physico-chemically by instrumental methods and by humid method. Chemical composition, specific surface area, chemical reactivity, density and granulometry will be determined. Crystalline structures and degrees of crystallinity will be determined by x-ray diffraction. The variables of each stage of the process will, when necessary, have their effect studied by chemiometric techniques. The results obtained will be analyzed to verify the technical and economic viability of the process in the production of magnesium hydroxide on an industrial scale.

185 Editing and Publication System for the WWW

Coordinator:
Rodrigo Fernandes de Mello

Company:
Radium Systems Ltda.

Approved value:
Phase 1: R$ 48,000

The objective of this project is the research and implementation of an innovative product for editing and publication on the World Wide Web on a large scale, while reducing time and costs. The production of content for the Web, whether in the form of training courses, distance learning or journalistic sites, has a high cost and a large preparation time. The numerous editorial and content publication products existing in today's market have various limitations, such as working in proprietary environments, lack of access to external sources of content, and non-reusability of modules and content, among others. The product proposed here is innovative because it adopts advanced technologies, such as the use of the 3-tier model of development, EJB specification platform, which promotes the re-use and rapid integration of components, adoption of Java language, with interactions with databases via JDBC, use of XML language to support access to databases of external and heterogeneous content, and the use of GPL (general public license) tools in the Linux environment. The product will be developed in the context of open source. Since it will be built in the form of components, new functionalities will easily be added to the product, which makes it flexible and easy to integrate.

186 Diagnostic Kit for Potentially Deteriorating Micro-organisms

Coordinator:
Soelly Magalhães do Valle

Company:
Tecxhall Tecnologia Ltda.

Approved value:
Phase 1: R$ 61,590 / US$ 5,000

Micro-organisms play an important role in the bio-deterioration of materials and, in a general way, in industrial processes. Some examples: the presence of algae, strong odors, stains, unexpected fermentative processes, among others. What's serious is that industries only manage to detect the problems of bio-contamination when all is lost, because there is no fast, safe, economic and efficient control to indicate that the situation is at green (bio-contamination under control), yellow (biocontamination in state of alert), or red (bio-contamination at dangerous levels). At present the service for controlling industrial bio-contamination is effected through complicated and expensive techniques. The present project proposes the use of diagnostic kits to monitor bio-contamination in industrial systems, in products and raw materials. The project for the development of analyses of biodeteriorating bacteria in kit will confer the following advantages: efficiency, practicality, speed, economy and above all safety for the health of the operator and of the environment. In addition to the safety of the integrity of the kit itself, since one of the great problems of laboratory techniques is the fact that external microbiological contaminations

occur which could conspire to mask the results. The realization of the project will help businesses and government to gain access to fundamental information, which is presently difficult to ascertain and control.

187 Preparing Future Entrepreneurs

Coordinator:
Valéria Maria Barros de Andrade

Company:
Desenvolvimento e Tecnologia Mentortec Ltda. (Red Tecnologia S/C Ltda.)

Approved value:
Phase 1: R$ 39,200
Phase 2: R$ 190,460

The objective of the project is to develop a piece of software with an interactive learning environment aimed at future entrepreneurs. Its focus is to give guidance in an objective and integrated manner on the structuring of a technology-based project, transforming ideas into business. The application was structured in four units which touch on and demonstrate the interconnection that exists between the following topics: Strategic Thinking, Product Conception, Business Plan and Financial Support. It possesses innovative characteristics: 1) Integration of the concepts Strategy x Product Development x Business X Resources via an interactive environment which prioritizes critical thought, the end result of which will be a decision taken on the make-up of the business, as well as on the credit agreement; 2) Ability to make intimate associations with the user's reality and analyzing potentialities and risks; 3) Adaptation of content according to the user profile at the time of execution, that's to say, the user can choose cases from his specific area and the environment will be automatically reconfigured to display the chronological path through the environment related to the case selected. As the main form of distributing this application, the Entrepreneur's Portal will be set up, which will permit the offer of additional services with specialized tutorials and a discussion forum among others.

188 Recovery of Lead Metal by an Electrohydrometallurgical Process

Coordinator:
Abel Edmundo Chacon Sanhueza

Company:
Global Eletroquímica Ind. e Com. de Metais Ltda.

Approved value:
Phase 1: R$ 70,000.00

In Brazil, lead mines are practically exhausted and the sub-products which contain compounds of this metal (concentrations of lead) generated by the mining industries of other metals have been exported. Consequently, the lead metal required for the manufacture of lead-acid automotive batteries has been supplied by imports and by the recycling of dead batteries in national metallurgy plants. The present project aims to develop and implement the electrohydrometallurgical process as an economical and environmentally appropriate alternative for the recovery of lead metal, initially from a residue rich in lead compounds, and in the future, from other raw materials, such as scrap lead-acid automotive batteries, lead mines (mainly galena) and from residues or effluents which contain lead compounds. By this process, the lead compounds contained in the residue will first be converted in lead sulfate. Following the lixiviation of the lead sulfate, lead metal of high purity (99.99 per cent) and easily commerciable will be electrodeposited on a stainless steel cathode contained in an electrochemical reactor.

189 Methodology of Online Teaching Applied to Courses Geared to Information Technology

Coordinator:
Armando Fernandes da Silva Moreira

Company:
People BrasilEducação Ltda.

Approved value:
Phase 1: R$ 50,355.00 / US$ 7,000.00

The objective of this research is the development of a methodology for e-Learning which enables the production of courses mediated by computer, geared to Technology Information. The research takes advantage of the developmental atmosphere of a business and part of its methodology for the production of its in-person courses to adapt and transpose its components to the model of distance courses and educational programs that will be implemented. The project defines the methodology of online teaching and orientation documents for the author, for the teacher and for the students. As a practical test of the theoretical bases, the project develops an online pi-

lot course on Basic Programming Logic for application to a group of students in public and private schools in Campinas. Using this pilot course a tool for online course management will also be tested.

190 Development of High Accuracy Current Transducers with Microprocessed Re-excitement Mesh

Coordinator:
Carlos Shiniti Muranaka

Company:
Globalmag Transdutores Magnéticos Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 22,600.00 / US$ 2,725.00
Phase 2: R$ 70,650.00

This project proposes to identify magnetic materials, cutting methods, heat treatments, detection and control systems which will enable the construction of high accuracy and low cost AC/DC current transducers. For current detection, commercial magnetic field sensors will be evaluated (for Hall or magnetoresistive effect). Various magnetic materials of high permeability will be characterized for verification of the quality of national and imported magnetic material and of the possibility of reversing the harmful effects of the cutting process by heat treatments. It will be possible to construct a data base of the various magnetic materials. One of the innovative proposals is in the implementation of a microprocessed re-excitement mesh which will permit the use of lower cost magnetic materials, making its commercialization on the Brazilian market easier. The conclusions of this study will lead to the gradual development of more accurate current transducers The principal motivation, in the medium term, is to develop small, low cost current alligator clips which can be attached to an oscilloscope. New configurations to increase the sensitivity of the transducers and extend their frequency response will be tested. The transducers' magnetic circuit will be optimized by means of simulation using the Finite Element Method, to optimize both the linearity and the sensitivity of the transducer. Magnetic circuits with more than one non-magnetic spacer will also be studied, aiming for the construction of bipartite current transducers. A study will also be made of methods for the linearization, calibration and compensation of the thermic variations of the transducers with the aim of implementing algorithms in microprocessors. Experiments will be carried out to verify the effect of high intensity current transitories on the calibration of the transducers. Immediately after, the possible methods of correction such as demagnetization, will be investigated. Finally, some studies on the effects of mechanical cuts on the magnetic properties of the nuclei will be investigated.

191 Photovoltaic generators for Aerospace Applications

Coordinator:
Célio Costa Vaz

Company:
Orbital Engenharia Ltda.

Approved value:
Phase 1: R$ 39,000.00
Phase 2: R$ 197,700.00 / US$ 45,313.56

Photovoltaic generators were and continue to be the most attractive form of energy generation for aerospace applications. Proof of this is the accelerated technological development witnessed in the last decades of their basic components and assembly processes. The objective of this project is the development and qualification of the special processes and tools necessary for the assembly of photovoltaic generators on structures for aerospace applications. Phase 1 begins with the collection of data on technical norms and the applicable generic requirements up until the final conception of the testing and qualification level. In phase 2, the objective is to develop and qualify the manufacturing processes, devices, and special tools in eight sub-phases, namely: 1) Implement and apply to the following sub-phases the Product Guarantee Plan worked out in Phase 1; 2) Manufacture of the Special Devices and Tools designed in Phase 1; 3) Acquisition of Complementary Materials, Components and Equipment; 4) Assembly and adaptation of the Special Devices and Tools; 5) Development of Manufacturing Processes by means of the manufacture of development test samples; 6) Manufacture of Qualification Test Samples; 7) Qualification tests; 8) Final Project Documentation. The envisaged results are technological capability and qualified manufacturing processes to meet the growing demand for energy generation equipment for the aerospace sector. Some direct benefits are the replacement of imports and the stemming of the outflow of foreign currency; local job creation; the possibility of exporting products and services with high technological content and added value; and, in addition, the possibility of applying this technology in the development of other products.

10th BIDDING INSTRUCTIONS

192 Applied Molecular Biology to the Rational Management of Ostriches

Coordinator:
Adriana Medaglia

Company:
DNA Consult Genética e Biotecnologia Ltda.

Approved value:
Phase 1: R$ 64,648
Phase 2: R$ 297,962

The ostrich industry is growing at a very fast pace in Brazil and in other countries, representing a world market in the order of millions of dollars. Brazil is considered internationally the country with the greatest potential for rearing this bird. Molecular biology techniques allow forms of rational management, providing an increase in the profitability in breeding for slaughter and reproduction, as well as possibilities for the early commercialization of animals. This proposal aims to develop and implement technology for the carrying out of genetic analysis in ostriches, from the collection of material in the field to the formulation of reliable products and services for the community of breeders. Productivity can be improved through the genetic selection of matrixes. The briefest description of genetic relationships diminishes the possibility of loss of genetic variability and even allows for the certification of the origin of the chicks. The sexing of very young animals, today carried out by cloacal examination, is difficult to interpret, generates errors and even causes stress, infections and lesions which prevent the commercialization of the bird. The objective of this study is to create improvements in the commercialization of very young chicks reliably sexed, as well as improving productivity, using matrixes that are not related.

193 Development of the Technology for the Metallization of Optical Fibers by Chemical Process

Coordinator:
Alexander Flacker

Company:
Optolink Indústrias e Comércio Ltda.

Approved value:
Phase 1: R$ 62,000
Phase 2: R$ 270,820

The hermetic encapsulation of optoelectronic components requires the use of metal solders in their interiors. In these encapsulations laser diodes and photo-detectors are used which have to be coupled to optical fiber which is composed of melted quartz. In order for the fibers to be attached by means of the solder process it is necessary that they have metal deposited on their surface. The technique of vacuum metallization is the most commonly used, but its cost is high. This project aims to demonstrate the viability of the deposition of metallic layers on optical fibers by chemical process at low cost. The process to be used will be an adaptation of a technique already mastered for the metallization of vitreous ceramic substrates. This study involves stages of superficial modification of the fiber (melted silica) through the use of watery buffer solutions. Into the structure modified in this way will be incrusted small nuclei of palladium metal which will be used as a support for the chemical reduction of the nickel which it is intended to deposit. Following this, on the nickel, an electrolytic thickening of metals will be carried out. These metals will enable the soldability of optical fiber in optoelectronic encapsulations. Having demonstrated the viability of the project in this first phase, the company embarked on the second stage of the work, which consists of preparing a chemical laboratory for the handling of the raw materials needed for this technology.

194 Mass Breeding and Commercialization of Trichogramma spp and Cotgesia flavipes for the Control of Agricultural Pests

Coordinator:
Alexandre de Sene Pinto/José Roberto Postali Parra

Company:
CP2 Ltda-ME (Bug)

Approved value:
Phase 1: R$ 72,876
Phase 2: R$ 279,725

The aim of this project is to make available to the user good quality insects, since the lack of this requirement represents the greatest obstacle to the

popularization of biological control in Brazil. Nowadays, there is enormous interest in the use of this alternative, but insects are not always available for purchase and, when they are, the biological specimens are not always of the desired quality. The insects will be produced using conventional techniques which will be fine-tuned, adapting them to the Brazilian reality, especially in the acquisition of components of artificial diets for breeding, lowering the manpower costs and monitoring biological characteristics through the generations to ensure the quality of the insect produced as well as its performance in field conditions. The project intends to use *Cotesia flavipes* (Cameron, 1891) in cane sugar, a larval parasitoid for the control of *Diatraea saccharalis* (Fabr., 1794), traditionally used in Brazil, and *Trichogramma spp.*, an egg parasitoid which can be used to control this pest in areas where the egg-predation is low or in areas where the climatic conditions did not permit the adaptation of the braconidae mentioned. In this case, *Trichogramma galloi* will be used, with other species of *Trichogramma* (especially *T. pretiosum*) being suited to commercialization for the control of lepidopterans in tomato (vine, staked and in greenhouses), cotton plants, maize, etc., since the production of these natural enemies is considerably advanced in our conditions.

195 Genetic and Zootechnical Evaluation of two Varieties of Nile Tilapia (O. niloticus var. Red-Stirling and O. niloticus var. chilatrada) for the Establishment of Program for the Mass Production of a Hybrid of Red Tilapia

Coordinator:
Alexandre Wagner Silva Hilsdorf

Company:
Agropecuária Saint Peter S/C Ltda.

Approved value:
Phase 1: R$ 30,804 / US$ 2,000
Phase 2: R$ 86,323.60

The production of fish in captivity has taken on an important role in the total amount of fish available for human food, the production of fishmeal and oil. Changes in eating habits, that is, the search for foods of animal origin with low levels of cholesterol and high protein value, has placed fish on the daily menu of many populations. Tilapia is a fish of African origin, however, it is farmed in various countries in the northern and southern hemispheres. It was introduced into Brazil in the 1950s and today it is to be found almost throughout the country, in commercial farms as well as reservoirs and artificial lakes. Among the varieties of tilapia used in pisciculture, the Nile tilapia (*Oreochromis niloticus*) has been the most widely bred. Red tilapia is a mutational variant which was discovered in the 1960s, in Thailand. Among the tilapia species in which the mutation towards the color red was observed, the *O. niloticus* is outstanding. The present project aims to develop an interspecies hybrid of tilapia which combines the superior zootechnical qualities of the chilatrada variety of *O. niloticus* with the red coloration of the *O. niloticus* Red-Stirling variety so prized by the market. The results presented in phase 1 of the present project underlined the potential of the Red-Stirling variety in terms of its zootechnical performance in field conditions, as well as its low index of endogamy, an important factor for the implementation of practices of genetic improvement through selection. Thus, with the establishment of phase 2 of the present project, the goal will be to produce beginning in the second year 3,410,000 young fish per year. Investment in this phase will enable the setting up of an intensive and continuous system for the production of young fish that will be monitored through the analysis of genetic markers to assess their quality.

196 Advanced System for the Production of Electricity with High Efficiency, Low Cost and Non Pollutant

Coordinator:
Antonio César Ferreira

Company:
Unitech Ltda.

Approved value:
Phase 1: R$ 31,570 / US$ 8,600
Phase 2: R$ 16,250

The project aims to develop a system for the production of electricity, using fuel cells integrated to a hydrogen production system. Two sources of hydrogen will be researched: solar energy (via the electrolysis of water) and ethanol reform. Studies of this first phase will be undertaken to ascertain the technological and economic viability of the two sources of hydrogen. In the case of water electrolysis, solar energy will be used as the primary source of energy. Despite the electrolysis of water being commercially used, its use in the production of elec-

trical energy is costly when compared to traditional means of generating electricity. In order to reduce the cost of hydrogen, experiments will be carried out to produce it by means of the technology of ion conducting polymer type electrolyzer. Electrolysis in ion conducting polymers has shown an energy reduction of up to 20 per cent. The price of the kilowatt/hour (kWh) with the use of the solar energy/electrolyzer/fuel cells system could be US$ 0.11. At this cost, this form of producing electrical energy could have enormous technological and economic potential. On the other hand, a cubic meter of ethanol can produce up to 5 cubic meters of hydrogen through the reformation reaction. In this way, the kWh cost could drop to US$ 0.049. This value makes the use of the ethanol reformation/fuel cell system to produce electricity extremely attractive. Also in the first phase of the project, new types of catalyzer for the reformation of ethanol based on Palladium, Platinum and Cerium will be researched. These catalyzers have been used in the reformation of natural gas, methanol and gasoline.

197 Management of Road Parcel and Freight Services via Internet

Coordinator:
Antonio Fabrizio Lima Passari

Company:
BR Express Ltda.-ME

Approved value:
Phase 1: R$ 24,045
Phase 2: R$ 149,980

The project aims to develop software tools to improve logistics operations, using the communications infrastructure of the internet allied to the tracking of packages and the positioning of vehicles via satellite. The proposal arises from the needs demonstrated during the operation of the system of freight contracts and the optimization of the transportation of cargoes developed by the company. The project is divided into two distinct but complementary modules. The first relates to the tracking of requests for collection, transport and delivery of merchandize. Information on the status of each order entrusted to a transport company – or even supplier/partner – is of great importance for the logistical planning and programming of its activity. The internet has consolidated itself as a means of communication which enables a cheap and economically viable solution for this case, especially for small and medium enterprises. The second module concerns the tracking of vehicles via global positioning satellites (GPS) and the making available of the positioning on the internet. The tracking, offered by businesses for many years, aims especially at security. Nevertheless, by placing the information concerning the position of each vehicle on the internet, it is possible to achieve cost reductions, an increase in flexibility and portability and, more importantly, it can also make the information accessible to the sender of the goods, enabling better logistical planning. The first phase of the project demonstrated that the technology available today now permits the development of such systems in an integrated form and with a relatively low final cost of acquisition and maintenance.

198 Electronic Anticorrosive OX-FREE Protection

Coordinator:
Ary Biazotto Corte Junior

Company:
Bhar Indústria e Comércio Ltda.

Approved value:
Phase 2: R$ 249,242

The present research project aims to characterize the theoretical methodology for anti-corrosive electronic protection, verifying results obtained from the field experiments to date. The work is divided into nine stages. Stage 1: implementation of electrical and electro-chemical experiments in laboratory; stage 2: the taking of measurements in the field and in the laboratory; stage 3: implementation of immersion trials in synthetic sea water, in synthetic sewer water; in a diluted solution of sulfuric acid, in a diluted solution of hydrochloric acid, in a diluted solution of sodium hydroxide and in water from the public supply; stage 4: implementation of soil corrosion tests; stage 5: implementation of accelerated corrosion tests; stage 6: implementation of field tests to verify the protective efficiency in marine atmosphere, urban atmosphere and industrial atmosphere; stage 7: evaluation of the body of evidence derived from the tests in stages 3 to 6; stage 8: simulation and analysis of the types of corrosive action in the body of evidence; stage 9: analysis of the results and establishment of criteria for the correct use and dimensioning of Ox-Free.

199 Stoq: A Flexible System for the Management of Commercial Companies

Coordinator:
Christian Robottom Reis

Company:
Async Serviços de Informática Ltda.

Approved value:
Phase 1: R$ 21,957 / US$ 1,200
Phase 2: R$ 80,740

The Stoq project involves the creation of a set of applications for the management of medium and small enterprises, built with the use of tools based on free software. The set of requirements expected from the project includes: ease of customization – Stoq has to be easily configurable to meet the needs of the different types of business; internationalization, given that the software needs to be easy to translate into other languages; integration with the community of developers, to which it must be accessible. In addition to this, the project must generate the offer of services to complement the software, among which installation, maintenance, training, customization and support. The proposal is to turn Stoq into a management platform to be widely used by national businesses, offering facilities for integration into the productive chain, distribution and customer support. The project now has an extensive knowledge base and has partnerships with commercial enterprises as it source of resource. In the second phase of the project, it is planned to develop the applications as well as the platform, on the basis of the process established in phase 1, and to work to make accessible and promote the use of the applications and platforms among institutions which can support and use the project's products. A set of software components has been established which will be fine-tuned to meet the stiff requirements of the application. This platform includes Python, ZODB, and GTK+ packages and Async, Kiwi and IndexedCatalog products.

200 Interactive Experiments for Scientific and Technological Education

Coordinator:
Dalton Gomes de Mello

Company:
Tecnorama Brinquedos Educativos Ltda.

Approved value:
Phase 1: R$ 75,000

The present proposal aims to research and develop experiments to test, in a judicious manner, existing equipment on the market (commercial standard) in terms of resistance of materials and adjustments needed for them to be used in interactive experiments. The intention is to adapt these items of equipment, with a view to better operating conditions, principally in terms of yield, in addition, to innovate their systems-standard regulation, adjusting them to new ends. The project also aims to establish a systematic and scientific criterion for the development and construction of new experiments. For this purpose, it is necessary to undertake a broad technical and bibliographical research, contract specialist advice in the universities and centers of research and seek partnerships with businesses interested in promoting their products and associating their name with a scientifically interesting experiment. In this sense, we will seek a technological refinement to manufacture new experiments, that will not only be very attractive, but also robust, practical, low in consumption and require little maintenance. Such an objective requires effort in the sense of refining projects and developing several prototypes. In this way, the endeavor is to improve the quality of experiments presented in the company to attract a greater public and to increase sales to other interactive museums.

201 Development of Processes for Syntheses of Desferrioxamine

Coordinator:
Durval Marcos Vieira

Company:
Erythro Assessoria Química S/C Ltda.

Approved value:
Phase 2: R$ 299,646

At present desferrioxamine is the only pharmaceutical of safe use in the reduction of the build up of iron in the organism. Although it is no longer protected by patents, its manufacture is carried out practically by a single laboratory and its commercialization has a high price throughout the world. The present project aims to develop an efficient process for the synthesis of desferrioxamine, which is required in order to enable its local production.

202 Complete Encapsulation of Discardable Blood Pressure Transducers

Coordinator:
Edgar Charry Rodriguez

Company:
Torr Microsistemas Integrados de Pressão Ind. e Com. Ltda.

Approved value:
Phase 2: R$ 155,100

The microelectronic technologies currently established, appear now as a strategic pillar which made possible an industrial revolution and, specifically now, permit a high competency in sensor technology. Thus, semiconductor businesses have entered the sensor market with a logical expansion of their activities in integrated circuits, because they already have most of the equipment necessary for their manufacture and the appropriate marketing channels. Silicon pressure sensors represent today the largest percentage in the world market of products generated by MEMS (Micro Electro Mechanical System) technology. This technology has over the last 20 years, drastically altered the markets for sensors, activators, instrumentation and control. The present research aims to develop a complete process for the manufacture of discardable silicon blood pressure transducers for biomedic use. This concerns a product without national parallel, which will shift the technological development of this area into a new gear. Torr Microsistemas is the fruit of 15 years research carried out in technological centers located in the State of São Paulo (the Polytechnic School of the University of São Paulo, EPUSP, the Institute for Technological Research, IPT, and the Heart Institute, InCor). The objective is to develop, manufacture and commercialize these devices to meet the demand from the health sector. The discardable blood pressure transducer consists of a silicon microchip, an internal capsule and protective gel, and an external capsule with interconnections and electrical and fluid connectors. The technical specifications of this transducer should conform to all the international norms.

203 Production of Porous Parts in High Performance Alloys

Coordinator:
Francisco Ambrózio Filho

Company:
Brats Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 61,040
Phase 2: R$ 228,000

Sinterized metal filters are produced using powder metallurgy techniques and the most commonly used is uniaxial compactation in matrix by hydraulic or mechanical presses. Depending on the type of application, a variety of materials may be used, among which bronze, stainless steel, inconel, hastelloy, monel, aluminum and titanium. In Brazil, the bronze filter market is well developed, with a few modest-sized companies active. As for other materials, there exists a large market to be exploited, especially of stainless steel filters 316L and 304L, which are the subject of this proposal. There exists demand for various applications, especially in the industry of gases with flame-cutter filters, dosers, attenuators, tubes and porous plates for the petrochemical industry and cartridges with or without seams for the alcohol industry, all in stainless steel. Some cases of special filters in inconel, monel and titanium for the chemical and nuclear industries were also identified. In the majority of these applications, all with high added value, components such as replacement parts are imported and the national industry has enormous difficulty discovering who makes these special parts to measure. The main objective of this research is the determination of the parameters for compactation and sinterization necessary for the elaboration of porous materials with the performance with appropriate characteristics for the applications of liquid-liquid and solid separation, in the mechanical, chemical and food industries. Phase 1 of this project verified the viability of the production of porous metal parts (filters) with high technical and commercial performance. Phase 2 seeks to make viable the installation of a manufacturing unit to produce parts which will replace the importation of a part of the porous elements consumed in Brazil.

204 Evaluation and Optimization of the Metallurgical Properties of Aluminum Billets for Extrusion Produced from Recycling of Scrap Metal

Coordinator:
Gisele Szilágyi

Company:
Metalex Ltda.

Approved value:
Phase 1: R$ 73,830

The quality and productivity of the extrusion process of aluminum alloys depends heavily on the raw material used, that's to say, on the billets obtained through the process of semi-continuous Direct Chill (DC) casting. Although the Brazilian market has a few suppliers of good quality DC billets, their costs of production are very high. This being so, companies which produce extrudes, the vast majority of which are not large businesses, end up relying on small suppliers or on the internal production of ingots (not DC billets), which leads to low quality of the billets and, consequently, to lower productivity and quality in their products. Thus, there is a lack in the production of good quality and low cost billets in the Brazilian extrusion market. In this scenario, the production of DC billets derived from the recycling of scrap metal is an excellent alternative compared to the use of primary aluminum, typically used by the large national producers of billets. The recycling of scrap aluminum also offers a substantial reduction in the consumption of electrical energy. However, the intense use of scrap in the production of billets could bring about problems of quality in the DC billets. The present project focuses precisely on this aspect: the replacement of primary aluminum with recycled aluminum in the smelting load, controlling the process, striving for a quality of billet comparable to the conventional billets obtained by using primary aluminum. The aim is to characterize the metallurgical quality of billets produced by a recently established company which uses an innovative process based on recycled scrap, having as main focus the effects of the use of scrap in the quality of the DC billets produced. To this end, comparisons will be carried out between samples of DC billets produced using recycled scrap and samples of DC billets smelted conventionally, by means of micro and macro structural analyses, as well as heat malleability. It is intended to produce good extrudability in those billets through the study and consequent control of the smelting process, and through the optimization of the thermal treatment of homogenization.

205 Study of the Means of Controlling the Flowering Time of Oncidium flexuosum sims. and Selection of Plants for the Reconstitution of Uniform Populations

Coordinator:
Hiroshi Ikuta

Company:
AFLORD - Associação dos Floricultores da Região da Via Dutra

Approved value:
Phase 1: R$ 25,280
Phase 2: R$ 121,365

The are serious problems which affect the commercial production of the wild orchid *Oncidium flexuosum*. The first is the intercrop between the months of January and April. The company promoted production during this period by the use of methods of photoperiod control and pruning. Precisely because it is a wild orchid recently adapted to commercial cultivation, the *Oncidium flexuosum* displays great variability, especially in the flowering period. One of the important pieces of research undertaken in the first phase of the project dealt with the selection of plants and the reconstitution of different populations which possess a well-defined flowering period, from April to August. The work was carried out at a rather slow pace since it demanded a wide collection of materials from a variety of sources, production trials with repetition and, above all, personnel skilled in reproduction by means of meristematic cultures in the laboratory with suitable conditions and equipment. Based on data obtained from trials in phase 1, for phase 2 a project was designed to select plants from the phase 1 based on crossbreeding between 60 plants selected from different sources. 300 crosses will be carried out between them and it is intended to obtain 200 plants from each one, making a total of 60 thousand progeny. The intention is to analyze the DNA of the plants selected and verify the possibilities of determining the most favorable crosses to obtain the desire genotypes. The selected progeny will be propagated *in vitro* and will constitute the commercial cultivars that will be distributed to producers.

206 Production of Purified Plasmidial DNA and Recombinant Proteins, on a Large Scale, for use in Vaccines and Diagnostics

Coordinator:
José Maciel Rodrigues Junior

Company:
Nanocore Biotecnologia Ltda. (ex-Life Sciences Ltda.)

Approved value:
Phase 1: R$ 23,525 / US$ 21,000
Phase 2: R$ 300,060

The project aims to develop the production of plasmidial DNA and recombinant proteins to meet the demand of researchers and also to open perspectives for a new profile for the company. The project introduces significant technological innovation, given that the national market does not have access to such a product. In the first phase of development of the project studies were undertaken of the purification process of plasmidial DNA in the scale of 1 gram, meeting the criteria of regulatory requirements, which permitted the start of the planned clinical studies, presently in progress, applied to the treatment of epidermoid tumors in humans and bovine tuberculosis. From the information available, it is the first time that a company has mastered the technology of purification of plasmidial DNA on a large scale in Brazil. The competitive differential is immense and the costs of production are 15 to 20 times lower. Two commercial proposals are presently being analyzed, in order to subsidize the development and clinical study of two DNA vaccines in development with national researchers. Phase 1 of the project aimed to obtain the large scale production of DNA and its results proved to be totally viable and they are in harmony with the broader aims of the project. Namely, the production of a vaccine against tuberculosis, which was recently patented by FAPESP and the University of São Paulo, USP, and optimized by researchers from USP and the Federal University of Minas Gerais, UFMG. The latter based itself on the incorporation of plasmidial DNA in biodegradable polymeric systems. In phase 2 of the project the aim is to obtain a stage of fermentation now on a semi-industrial scale (100 liters) and the production of micro-structured systems on a scale of 100 grams to 1 kilogram in order to enable clinical studies. The focus of this stage is the optimization of the production of plasmidial DNA and the application to other types of DNA in addition to the model worked on till then, which equates to the protein exposed to 65 KDa (hsp65) thermal shock and the development of the large scale production of non-living systems of transgenic infection based in biodegradable polymers and lipids on a pilot scale of cationic nano and microspheres and deprived of charges.

207 Visual Environment for the Development of Parallel Real-Time Programs (Visual_RT)

Coordinator:
José Roberto Pinto Ribeiro

Company:
Eonic Brasil Ltda.

Approved value:
Phase 2: R$ 48,725

This project aims to develop a graphical tool for the generation of source code for parallel real-time systems, executed with the support of the Virtuoso parallel kernel, developed by Eonic Systems. Virtuoso is built with a layer on top of C programming language, giving it functionalities similar to a parallel programming language. To offer support to the kernel a set of tools are required which assist in the development of parallel applications, debugging of errors and analysis of the requirements of real time. The aim of Visual-RT is to help in the generation of source code for programs executed in the parallel machine. In Visual-RT, applications are represented in a graphic model, which will be used to integrate the other tools which make up the visual environment. The main component of this model will be a graphic, where the nodes will denote the data structures of the parallel program and the peaks will represent the communication and synchronization operations related to these structures. The information from the graphical models could be complemented with text descriptions, that's to say, stretches of code written by the user. On the basis of the graphical and textual information, the tool will automatically generate the application source code. Visual-RT will also help the programmer to maintain continuity in the development of projects which use methodologies for the most commonly used real-time systems, facilitating the transition from the initial phases, that is, analysis and design, to the implementation phase. To help the programmer execute this transition, the tool will permit the development of prototypes of the parallel program, which will gradually be improved until the final product is obtained.

208 Development of Computational Tools for the Teaching and Learning of CNC Usage Processes

Coordinator:
Marco Stipkovic Filho

Company:
Adiante Informática Ltda.

Approved value:
Phase 1: R$ 11,520
Phase 2: R$ 59,380 / US$ 15,039

This research project aims to develop educational software to promote and facilitate the teaching of usage processes with the use of CNC technology in institutions of technical and higher level. The main justification is in the fact that there is a lack of computational teaching resources of national origin (native in Portuguese language) – low in cost and of compatible performance with the installed computer base in schools –, which are capable of promoting the teaching and learning of usage processes. CNC technology was chosen as facilitator of this process, given that it offers a flexible, programmed form, capable of being implemented via software. In phase 1 of the project the following activities were promoted: analysis of the project viability based on market conditions (customers, competitors and suppliers) and technology (software, algorithm, performance); analysis of the computational tools of development and support, which culminated in the generation of functional prototypes of the modules of turning and machining capable of interpreting and simulating CNC programs in ISO language. In the second phase, the proposal is to elaborate the necessary algorithms, among which the topics of tool selection and process conditions; to fine tune the man-machine interfaces and codify events; to generate support material; to carry out preliminary tests of programs under conditions of use; and to promote certification and production.

209 Development of Compounds from Ceramic Waste as Replacement for Granite, Wood, and other Quality Facings

Coordinator:
Paulo Carlos Galin

Company:
PERC - Engenharia Ltda.

Approved value:
Phase 1: R$ 68,934
Phase 2: R$ 198,000

The proposal contemplated is innovative with regard to the components of the compound, that is to say, the present project aims to develop a hybrid compound based on PMMA and inorganic materials on the national market, such as: assorted industrial waste, aluminum, granite dust, marble dust, glass dust, among others, which may confer interesting properties on the polymer such as those observed in the literature studied. The components of the polymer/ceramic system were selected on the basis of properties and compatibility/stability of the mixture. However, other polymers and mineral loads will be tested to improve the performance and decrease costs. These products should be totally recyclable or possible to source in the environment without any great worries or controls. For the first time, the use of reticulation by ionizing radiation was proposed as a basic tool for this class of product. The application of radiation induced polymerization to the system composed of methyl methacrylate monomer base, mixed with other components will allow for fine control of the reaction, since radiation polymerization enables a greater control of the process, as the energy can be delivered directly to the reactive mass without heat transmission problems. In the application of this technique bubbles and products of thermal degradation are absent, since radiation dispenses with the use of radicalar initiators. The absence of residual monomers is also confirmed, since radiation allows for higher conversion than in any other process, eliminating the presence of monomers which can post-polymerize. In addition to this, in the case of irradiation by accelerated electrons, curing is immediate.

210 Development of an Operational Prototype for an Alternative Rotating Engine Known as Tetracycle

Coordinator:
Olympio Sambatti

Company:
S.H. Empreendimentos e Participações Ltda.

Approved value:
Phase 2: R$ 174,520

This involves a project which went through a long initial phase of development as proof of concept, in which two engineering models were studied which demonstrated excellent qualitative results. The engine is a technological innovation, presenting a low weight/power relationship associated with a high torque. It possesses four combustion chambers in the form of cylindrical sectors delimited by four juxtaposed and rotating pistons which execute a non uniform movement between them, permitting admission, compression and escape. Each rotation of the set of 4 chambers/4 pistons, permits a sequence of four explosions. The present phase of the project proposes to develop and manufacture a working

prototype in order to obtain quantitative results with a view to its qualification, industrialization and commercialization. The work will be divided in four stages: design, manufacture and assembly, tests in bench trials and verification of performance.

211 Development of Integrated Management System for Ostrich Breeding ventures

Coordinator:
Ricardo Firetti

Company:
Brasil Ostrich - Coml. Imp. e Exp. Ltda.

Approved value:
Phase 1: R$ 60,660
Phase 2: R$ 117,879 / US$ 156,964.20

Brazil is considered in the world ostrich-breeding community as one of the countries with the greatest growth potential in this activity. The vigorous growth of flocks in the country has been noticeable over the last few years. The first imports occurred in 1995 and the market has grown at rates of around 30 per cent per year. However, for Brazilian ostrich-breeding to achieve a competitive space in the market, certain actions have to be set in motion. Amongst them, effective tracking programs, the genetic improvement of flocks and improved management of the businesses which comprise this activity; it would be of considerable value to create a mechanism for centralizing technical and economic information, thus enabling an efficient business management process, imposing traceability on the products and making available data on the origin of the animals. This is the basic proposal of the present project which aims to develop a piece of software in partnerships with businesses specialized in the breeding of ostriches and in computer science, capable of bringing together indispensable information for the management of business and the implantation of programs of genetic improvement geared principally to the productive segment. Phase 1 of the project regards the technical viability of the proposed ideas via the gathering of information pertinent to the system, to the definition of its scope and logical functions and the analysis of the alternatives of support software in its elaboration. Phase 2 proposes to develop a system of computerized management which helps in the control, storing, organization and processing of data from the entire production process of ostrich breeding.

212 Manufacture of Self-reducing Manganese Pellets

Coordinator:
Ricardo Silveira Braga

Company:
Agronutri Indústria e Comércio Ltda.

Approved value:
Phase 2: R$ 190,000

The work involves the manufacture, characterization and reduction of self-reducing pellets of manganese ore, using an alternative binder which permits the cure of the pellet in cold state. Initially the binder to be used is an industrial residue with no technological application, which constitutes an environmental problem for its producer. This residue is the dust from the dedusting system of electric reduction kilns which contains compounds which, on reacting in the presence of water, permit the formation of solid hydrated compounds which serve as a binding element between the crystals of ore and reducer, creating a pellet resistant to cold and hot management. The intention now is to synthesize the binder, so as to offer the same binding features as the dust from the dedusting. This artificial production will be based on identification of the mechanisms which cause the cold binding. In this phase the behavior of the pellet will be studied, with variations in the proportions of CaO and $Si0_2$ and K_2O of the same (tricalcic, pozzolanic and crystallized bonds). These variations will be obtained through the appropriate mixture of binder, Portland cement, aluminum cement, microsilica and activated ash, among others. 50 ton lots will be produced, reduced in electric kilns and rotating kilns for the production of manganese monoxide and high-carbon ferro manganese. With this, an analytical study of the reduction mechanism will be carried out which, comparing with previous results, could considerably alter the understanding of the process. These results will permit the complete modification of the manufacturing processes of manganese and ferrous monoxide, manganese-based alloys, with a conservatively estimated reduction in cost of manufacture of up to 35 per cent.

213 Production and Commercialization of Equipment for the Electro-Chemical Treatment of Watery Industrial Effluents Containing Organic Pollutants

Coordinator:
Rosângela Rodrigues Leme Pelegrino

Company:
Tech Filter Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 50,746
Phase 2: R$ 281,972

The aim is to transform the electro-chemical oxidation process of organic pollutants in an industrial process which does not require the addition of any chemical reagent, does not generate sub-products that require new inertization treatments, have a faster kinesis than biological treatments and occupy a smaller physical space. It is intended to design, build and optimize electro-chemical reactors for the company's use and to be commercialized. For this purpose, designs and tests will be undertaken aiming to anticipate the occurrence of problems arising from the transposition onto an industrial scale, with the proposal of possible solutions. The work also includes the design, detailed dimensioning and selection of materials for the reactor and its components, hydraulic installations, electrical installations and power supply and measuring and control instrumentation. A test module will be set up for experimental operation to support the project in terms of the optimization of the distribution of electrical current in the anode, the optimization of the distribution of fluid velocities, the choice of a suitable material for the turbulence promoter, and the processing of samples previously characterized for the evaluation of the reactor's performance. The basic proposal of phase 2 of the project centers on the construction of a mobile effluent treatment station with a 60 m^2 area of anodes for electrochemical treatment attached to ten photo-electrochemical reactors as complementary treatment. The mobile station will be placed into operation, for periods of two to three months in companies that have participated in the project up to the present time, which opened their effluent treatment stations so that the analytical monitoring of their waste could be carried out.

214 Development of Instrument for Measuring Thermic Diffusivity of Materials by the Energy Pulse Method

Coordinator:
Thomaz Augusto Guisard Restivo

Company:
METALTECH Sorocaba Equipamentos e Serviços Ltda.

Approved value:
Phase 1: R$ 35,566
Phase 2: R$ 167,215

The project aims to develop an instrument for the measurement and evaluation of the thermal diffusivity and conductivity of materials with a view to its commercial exploitation. The technique to be employed uses a pulse of energy, in this case a visible light (flash) of brief duration, striking the face of a discoid sample, established at a certain temperature in the range of 20-1200°C. A temperature sensor records the progression of this on the sample's opposite face in terms of time (thermogram). The data is collected and transferred to a piece of software which develops the routine for the determination of thermic diffusivity using the thermic quadrupole method. In the first phase of the project a prototype was set up for the ambient temperature with an option up to 60°C. The results were compared for some materials, using the existing laser pulse instrument in the Materials Laboratory in the Navy Technology Center in São Paulo (LABMAT -CTMSP). Phase 2 of the project involves the consolidation of the instrument as a commercial product, including the physical set-up of the components, conception and construction of the control panel, automatic acquisition system and adaptation of the analytical software. A heating oven will be added to the system which will make it possible to analyze thermic diffusivity in different isotherms, in addition to establishing the maximum temperature at which the instrument can be used. An infrared sensor will be evaluated along with thermopair sensors. Operating, control and analysis software will be developed aiming to automate the test. Other applications of the system, with the simultaneous determination of thermic capacity and evaluation of conductivity are also envisaged.

215 Robotized System for Inspection of Tubing

Coordinator:
Walter de Britto Vidal Filho

Company:
MWA Comércio e Serviços Ltda-ME

Approved value:
Phase 1: R$ 46,276

The project involves the presentation of a venture in the area of working mobile robots to develop a robot for inspecting ducts from their interiors. In the first phase of the work a prototype will be developed along with a technical verification of its viability. The prototype will be based on a platform for movement in straight or curved, horizontal or sloping tubing, with diameters varying from 250 to 500 millimeters; it will have a control architecture to which an operator issues orders in response to images captured by high resolution cameras positioned at both ends of the vehicle. The video cameras will possess an actioning mechanism. To this first prototype a piece of ultra-sound equipment will be attached for measuring the thickness of the duct wall. Some market requirements to be addressed by the company by means of the project currently being presented will be: the undertaking of inspections without the need for dismantling or moving – which reduces the cost and the time spent on the job; the inspection of buried tubing; the inspection of tubing where "instrumented PIG" type of equipment is unable to operate; the localized inspection of tubing, valves and/or duct accessories. The main users of the product/services to be catered for by MWA should be businesses from the oil and gas sectors, chemical and petrochemical industries and petrol refineries.

11th BIDDING INSTRUCTIONS

216 Development of High Performance Adhesive For Use in Urban Traps

Coordinator:
Antonio Ademir de Andrade

Company:
Colly Química Indústria e Comércio Ltda - ME

Approved value:
Phase 1: R$ 57,212
Phase 2: R$ 253,235

The project involves the development of a permanent adhesive glue resistant to bad weather. Based on previous experience the base used is polyolefin and polyisobutilene elastomers as these are almost totally saturated and offer high resistance to oxidation in atmospheric conditions. The elastomers mentioned must be mixed with synthetic hydrocarbon resins and plastifying oils. The basic compositions (elastomer + tackfier) in a sealed mixer (Bambury) to lower the fusion point of the elastomers. The final compositions of the formulations will be done in heated open boiler. The adhesives obtained will be analyzed for viscosity at temperatures of 1200ºC and 1500ºC, using Brookfield viscosimeter, and softening point, using equipment appropriate for the test. The melted adhesives will be placed on polystyrene sheets with the appropriate format, using the Hot Melt applicator. After cooling, they will be analyzed for initial adhesion with an Emic dynamometer and force of static shearing, using a weight of 1 kilogram per square inch of surface. The result will be the best formulation for the production of a pilot batch which will be evaluated and aged – both real time and accelerated – for three months in a forced air circulation oven. On the basis of good results obtained in the first phase of the project, in the second it is intended to develop and produce glue traps for mice, cockroaches and flies.

217 Optimization of Performance of Heat-reflecting Curtain, Aiming for Reduction of Energy Consumed in Thermal Conditioning

Coordinator:
Antonio Sergio Assunção Tavares

Company:
Vacuoflex Tecnologias Refletivas Ltda.
(ex-Quiminox Ind. e Comércio Ltda.)

Approved value:
Phase 1: R$ 74,900

The aim of this project is to develop a heat-reflecting curtain capable of providing a considerable reduction in the consumption of energy in the thermal conditioning of the building, or an increase in the thermal comfort of naturally climatized rooms. It is known that the glassed areas of a building, owing to the poor thermal insulation they offer – against heat conduction or solar radiation – are responsible for a large part of the thermal exchanges which occur between the building and the external environment. In warm and sunny climates such as Brazil, in buildings

with several floors, the heat that enters via the glassed areas accounts for the most important part of the heating. This being so, the idea to use a curtain with a high degree of thermic insulation seems an obvious solution to improve the thermal comfort of a room and ultimately increase the effectiveness of the conditioning equipment. The use of reflective insulators allows for the creation of light, cheap curtains, that are thin and have a high degree of thermal insulation in conduction and radiation. The quantification of the thermal performance of this reflective curtain will permit the cost/benefit calculation for the product in various situations, making a solid base for its development on an industrial scale possible. Therefore, two test installations will be set up. The first to determine the shading coefficients of the various alternatives for use as reflective barrier under evaluation, and the second for the setting up of prototypes developed for evaluation of the aspects of mounting and reduction in energy consumption in small air conditioning units.

218 Io – Intelligent Sensor for Applications in the Electrical Sector

Coordinator:
Bruno Abrantes Basseto

Company:
AdTS Engenharia e Automação p/ Setor Elétrico e Industrial Ltda.

Approved value:
Phase 1: R$ 75,000

The expansion of the Brazilian electrical sector has suffered a number of restrictions which bring it close to its installed limit, operating under critical conditions. Faced with this, more effective automatic monitoring systems have shown themselves to be essential, with the support of advanced information systems, capable of assisting operators in generation, transmission and distribution. With the precise information supplied by such sets of resources, the planning of investments or the programming of repairs can be carried out in a more efficient and effective manner. The proposal to develop intelligent, so-call Io, sensors, dedicated to the monitoring of power equipment, offers a very promising alternative to several of the problems currently facing the electricity sector. The use of small, low cost data acquisition devices, installed in close proximity to the transducers of the signals to be monitored, can appreciably simplify the systems for conditioning signals and reduce the cabling required, contributing greatly to the overall cost reduction. These sensors, since they have the capacity for the local storage of data and since they are interconnected in an expandable system on a fiber optic network, which offers great immunity to electromagnetic noise, represent a flexible and efficient solution. Since such devices carry microprocessors, they offer local processing capacity, enabling the volume of information exchanged between the various components of the diagnostic system to be enormously reduced, among other advantages. The introduction of such intelligent sensors to the predictive diagnostic system should permit a significant reduction in the costs related to the data acquisition systems in the field and also an appreciable improvement in the performance of the system as a whole, with the increase in the local processing capacity of the intelligent data acquisition units.

219 Fiber Optical Silica Amplifiers Doped with Erbium

Coordinator:
Carlos Kenichi Suzuki

Company:
Sun Quartz Indústria, Comércio e Manutenção de Dispositivos e Equipamentos para Área de Telecomunicações Ltda. (ex-Optolink Ind. e Com. Ltda.)

Approved value:
Phase 1: R$ 74,480
Phase 2: R$ 223,622 / US$ 12,700

A large number of fiber optical amplifiers work with silicon amplifying fibers doped with erbium. While Brazil has considerable industrial potential to produce standard optical fibers, erbium fibers are still an imported product. Based on the long experience acquired by Integrated Quartz Cycle Laboratory (LIQC) in VAD (Vapor-phase Axial Deposition) technology for the manufacture of silica preforms for optical fibers, this project proposes the development of erbium fibers following five basic stages of VAD processing, considering this to be the most efficient and economic manufacturing method: a) sourcing the porous silicon preform; b) doping with erbium by immersion of the porous preform in liquid solution; c) thermo-chemical treatment for drying, the elimination of hydroxyls and consolidation in totally transparent preforms free from micro-

bubbles; d) make up of the mechanical jacket for over-cladding; and e) pulling into optical fibers. The methodology of doping with erbium (diffusion) will be carried out by immersion of the porous silica preform in liquid solution. A large part of the detail in the various stages of processing the preform will be carried out using the available infrastructure in LIQC and in the Materials Engineering Department of FEM. For the pulling of the fibers and their characterization we will be able to count on collaboration from Xtal Fibras Ópticas and the Fiber Optics and Photonics Group of the Institute of Physics in the State University of Campinas, UNICAMP. It is interesting to point out that the high value added to erbium fibers, combined with the small volume of production to meet demand in the country, offers another great advantage to the project. Both the phases of R&D (Phases I and II), and the commercialization stage will be able to be carried out using the already established infrastructure in LIQC.

220 Development of an ELISA Kit for the Detection of Aflatoxine B1, Aimed at the Control of Grains, Foods and Animal Foods

Coordinator:
Claudete Serrano Astolfi Ferreira

Company:
Al-Tech Comércio e Importação Ltda.

Approved value:
Phase 1: R$ 62,227
Phase 2: R$183,890 / US$ 36,891.20

Mycotoxins are metabolytes produced by fungi which grow naturally and contaminate grains, animal foods and human foodstuffs. When ingested they can cause varying levels of toxicity depending on the type, the quantity of toxin, the species, the sex and the nutritional state of the animal. Besides this, some mycotoxins, and particularly aflatoxin, have been described as important carcinogenic, mutagenic, teratogenic agents or causers of estrogenic effects. The detection and subsequent control of contamination by aflatoxins are carried out by means of sensitive and specific analytical tests. Historically, physico-chemical methods such as high performance liquid chromatography (HPLC), thin layer chromatography (TLC) and gaseous chromatography (GC) are traditionally used for these determinations. Although these methods offer a high level of reproducibility, they are onerous, slow and require specialized personnel, since carcinogenic chemical reagents are used in the manipulation. The techniques of immunological tests have shown results of high specificity and sensitivity, do not present health risks to the manipulator and require simple and rapid steps for the diagnosis. In addition, they allow a much larger number of tests to be carried out at a lower cost, leading consequently to a better control of grains, foodstuffs and animals foods. In phase 1 of the project, the standardization of an ELISA kit for the detection of aflatoxin B1 was carried out by direct competition, using commercially acquired monoclonal antibodies. In phase 2 the standardization of an ELISA kit will be undertaken using monoclonal antibodies produced in Brazil, making this technology accessible to a greater number of patients.

221 Graphical Model of the Dependence between the Rules of Business and the Physical/Financial Impact on Maintenance

Coordinator:
Denise Stringhini

Company:
Apyon Technology Ltda.

Approved value:
Phase 1: R$ 49,244
Phase 2: R$ 167,468

The most critical stages of the development of systems are their design and implementation. In the project, user interfaces, rules of business and physical models are specified. The rules of business are all the calculations, assumptions, validations, procedures and events of a system. These rules are specified in natural language, normally without standardization. Following this stage, they are sent to the programmers, who are going to transform the specifications into source code in some programming language. The main problem existing in this process is that the rules are inter-dependent and the analysis of impact of a change in one rule is a repetitive, manual task, and prone to mistakes. Frequently the dependence is not explicit, since it occurs only in certain specific conditions, which demands interpretation and knowledge of business on the part of the systems analyst. The objective of this work is to facilitate the search for the dependencies of the rules of business, helping the systems analyst evaluate the impact of a business change, as much in the volume

of work required as in the number of physical and human resources necessary. In phase 1 a functional prototype was developed of an application to show visually the dependencies between the rules of business and also the physical and financial impact of the alterations and evolutions in the specifications. In phase 2 this prototype will be finalized, documented and totally integrated into Apyon Studio, which is a productivity tool that permits specification at a high level of abstraction and also permits the generation of the part related to the technology of an information system. The result of phase 2 should be the commercialization of a product to be integrated into Apyon Studio.

222 Parallel Processing on the Internet or in Corporate Networks

Coordinator:
Eduardo Javier Huerta Yero

Company:
Prógonos Consultoria & Comércio Ltda.

Approved value:
Phase 1: R$ 25,200
Phase 2: R$ 132,700

With the advance of information technologies and the development of computational infrastructures, such as networks capable of interconnecting up to millions of computers scattered throughout the world, we have at our disposal today enormous computational resources at relatively low costs. The possibility of using groups of computers in the search for solutions to complex problems is today a palpable and desirable reality. However, there are numerous difficulties in managing the processing of data in mass parallel environments, also called computational grids. In this research project, we propose the commercial development of a software platform capable of managing an arbitrarily large group of computers in the sense of making them work cooperatively on the solution of complex problems. Such a platform will permit, in this way, the computational power latent in networks of computers of whatever dimensions to be taken advantage of and at low cost.

223 Recycling of Reticulated Polymers

Coordinator:
Edson Ghilardi

Company:
Plastiviva Aplicações e Reciclagem de Polímeros Ltda.

Approved value:
Phase 1: R$ 72,600

There is ever increasing pressure in society not only in the sense of encouraging recycling but in deterring, by means of legislation, the deterioration of the environment with heavy fines in sectors of the economy such as producers of electric batteries and chemicals/packaging, which pollute rivers and streams. Our objective in this project is to develop the industrial procedure for breaking the chemical bonds responsible for the reticulation of plastics or rubbers by the application of high energies, such as microwaves, ultra-sound and others. These techniques are probably the most efficient, clean and economic process for recycling reticulates, since they break down the two-dimensional bonding scheme of the reticulation, without depolymerization of the polymer and permit new reticulation (or vulcanization) with properties equivalent to the original compound. In this case, the recycled material returns as an active commodity. Very efficient for nitrilic rubbers (NBR), neoprene (CR) and polymers which possess polar groups, this method uses doses of microwave energy at a specific frequency and in sufficient quantity for the effective de-reticulation of the polymer. The research developed for each application leads to a process (sonic or microwave) always combined with a concentration of chemical products (processing auxiliaries) with a dosage of around 2 per cent. It is sold at R$ 20.00 per kilo, which represents a cost of R$ 0.40 per kilo of recycled material which, added to the costs of processing, in general R$ 0.50 per kilo, amounts to a total of R$ 0.45 for a material with a virgin resin price of R$ 3.20 per kilo for EVA and which rises above R$ 8.00 for imports such as neoprene and EPM/EPDM.

224 Development of Standardized Materials for the Manufacture of Herbal Remedies and Vehicles appropriate for their Applications

Coordinator:
Luis Daniel Loyola Herrera

Company:
Multi Vegetal Ind. e Com. de Cosméticos e Prod. Naturais Ltda.

Approved value:
Phase 1: R$ 41,820

The objective of this project is the development of standardized vegetable extracts from national medicinal plants for use as materials in herbal remedies and cosmetics and also for use in various kinds of colloidal vehicles and their possible pharmaceutical forms. Standardized extracts will be defined as those vegetable components which are of a defined origin and within the quality guidelines laid down by the National Agency for Health Vigilance, Anvisa, and the industrial and laboratorial manipulation of which adhere to operational procedures laid down in norms accepted by the Ministry of Health and the chemical standardization of which is established by the application of known biological markers/active principles. In the first stage of the project five plants from the national flora will be studied: andiroba (*Carapa guayanensis*); marcela (*Achyrocline satureioides*); pau ferro (*Caesalpinea férrea*); carajirú (Arrabidaea chica); cherimoya (*Annona muricata*); melão-de-são-caetano (*Momordica charantia*). Qualitative phytochemical characterization will also be done on extracts of each of the species and tests of formulations with these extracts in colloidal vehicles (creams, gels, lotions, syrups, and others). The work will be carried out on the company's premises and in the phytochemistry laboratory of the Institute of Chemistry in the Paulista State University, Unicamp, and the preliminary toxicological trials in the Pluridiscipline Center for Chemical Research, CPQBA, in UNICAMP.

225 Use of Mobile Internet as a Tool for Distance Learning

Coordinator:
Luis Fernando Reis Tavares Pais

Company:
Infosoftware Sistemas

Approved value:
Phase 1: R$ 26,300

Businesses are looking more and more to invest in the up-skilling of their co-workers, so as to increase their knowledge base and achieve, through this, a competitive edge. Within this context, the use of e-learning in businesses is increasingly more widespread. With the emergence of mobile communications tools (palmtops and cell phones), the use of Internet via them has been ever greater. The tendency, according to several pieces of research, is that this usage is primarily adopted by corporations, with various benefits in terms of agility and efficiency, among others. Taking into account these parameters, an e-learning solution with use of mobile internet will permit, in addition to mobility, more effective training with lower costs. In this context, Infosoftware Sistemas will develop a system of m-learning (distance learning with mobile communications tools) using cell phones and palmtops which can work on or off line. The main objective of this project is to develop, by means of research which will also involve researchers from the area of distance learning, the necessary structure for this solution to work. At the end of this study we will have a totally defined solution ready to be implemented. With the implementation of this project, Brazil will occupy an outstanding position in the international panorama, situated in the group of the countries most developed in the wireless area. In addition, the project may open possibilities for the development of other solutions, involving people communication and using these devices, which will increase the commercial potential of the solution.

226 Clothes Press

Coordinator:
Nicola Getschko

Company:
Coll Projetos, Engenharia e Tecnologia Ltda.

Approved value:
Phase 1: R$ 28,190
Phase 2: R$ 182,954

This project aims at the development of a totally new automated product, with low consumption of electric energy, innovating the process of pressing clothes and decreasing user's the time and effort on this task. The operating principle of this equipment consists of exposing the dry items of clothing, hung on appropriate hangers, to a constant flow of saturated steam combined with a pulling effect, when necessary, so as to achieve the relaxation and the relief of residual tensions in the material fibers. Once the relaxation cycle is over, the stage of drying by forced convection follows, which is also intended to maintain the micro-geometry of the fibers in the material, obtained in the previous cycle. The relaxation cycle begins with the generation of steam, in the lower part of the equipment, creating an up-

ward flow by natural convection, impregnating all the items of clothing. A system for generating hot air, installed in the upper part of the equipment comes into action after the relaxation cycle, removing all humidity and completing the smoothing, obtaining in this way the final conformation of the items of clothing. In addition to being pressed, the clothes have been deodorized and made hygienic. The sequence and the duration of the relaxation and drying cycles are controlled automatically, by means of an electronic control system which operates in a closed grill. Temperature and humidity sensors provide information to the control system which defines the time for each cycle. The operation, on the user's part is very simple, merely having to activate the on/off button. The product is aimed at domestic consumers, hotels, hospitals and tailoring businesses, among others.

227 Software for the Study of Hazard and Operability

Coordinator:
Paulo Eduardo Pascon

Company:
Processos - Soluções de Engenharia S/C Ltda.

Approved value:
Phase 1: R$ 13,680 / US$ 6,500
Phase 2: R$ 204,999

The technique of identifying hazards known as the Study of Hazards and Operability, developed in England more than 30 year ago, is a recognized procedure worldwide and its application in Brazil is increasing, principally in the chemical, petrochemical and oil and gas sectors. It is one of the most comprehensive and systematic techniques known for assessing the safety of manufacturing units and transport systems. Its operation is normally carried out on a word processor of the MS-Word type. However, given the characteristics of the technique, the time required for its application tends to be long and incompatible with the human resources that are normally available. In addition, the documents produced in this way are difficult to manipulate and mix with other types of assessment, for example a quantitative risk analysis, increasingly demanded by the Brazilian regulatory agencies for the purposes of environmental licensing. Some businesses abroad have now developed software for the application of this technique, but nothing similar has been noted in Brazil. It should further be highlighted that the software available on the external market is available in the English language, is not compatible with other types of assessment and has a cost which is still considered high by Brazilian standards.

228 HIC TV – Facilitator for Interactive Shopping via Television and Radio

Coordinator:
Pedro Ricardo Drummond

Company:
Digicall Eletrônica e Telecomunicações S/A

Approved value:
Phase 2: R$ 199,308 / US$ 28,540

The present project aims to develop a device (HIC TV) which will enable television and radio transmission shopping, and interactivity in television and radio programs. The functions are carried out via high-frequency audio communication from the receiving apparatus previously installed in a particular place by the customer (TV and radio) to the device that is the object of the present project. In this way, in a TV transmission in which a product is offered for sale, the product information is transmitted together with the audio signal (voice or music) of the advertisement. These signals are of a frequency close to the limits of human hearing and are received by the device, which shows the product name and its price in a liquid crystal display or on the TV screen, via its own character generator. If the user wishes to acquire the product, he presses a key on the device, which in turn will raise an automatic purchase order or will initiate contact with the help desk of the company selling the goods, using the telephone line. Enabling interactivity, the device can be used for the measurement of TV or radio audiences, for the participation in question and answer programs, and for the participation in TV or radio surveys, amongst other applications. It is important to point out that both objectives can be achieved without the need for any high cost installation in the user's environment. No installation is necessary to special access to any data network, whether internet or any other, not even the replacement of the television set with another model. HIC TV is simple to install, low cost and permits shopping users to enjoy the advantages it offers.

229 Integrated Project for Production of Buildings – A New Methodology in Project Development

Coordinator:
Rita Cristina Ferreira

Company:
DWG Arquitetura e Sistemas S/C Ltda.

Approved value:
Phase 1: R$ 41,947

The integrated project for the production of buildings aims to meet the demand of the civil residential construction market for a unique and harmonized project. It addresses a growing concern among construction companies and administrators in the area of planning and product management, in relation to the need to reduce costs, guarantee quality and increase competitiveness among businesses. DWG Arquitetura gained significant experience in this market through the development of the Masonry Project, which as it unfolded revealed the existence of a demand for the evolution of the services offered. Thus, from the Masonry Project, DWG progressed to the Partitions Project, which included the integrated harmonization between various systems. At the same time the Masonry Project became consolidated as a Project for the Production of Partitions (for systems with block walls and plasterboard). With the present project it is intended to extend DWG's experience in the development of research into the production of the other systems which make up the building, adding computational procedures for automation, project control and collaborative work between multi-disciplinary teams. The objective is to generate an increase in quality and efficiency in the planning and production of the building. The result of the methodology of the project combined with the computational tools will constitute the Integrated Project for Production of Buildings, in a systemic manner. The specific research procedures in this first phase are: the collection of data on tools presently available on CAD and databases, associated with internet resources which offer conditions for setting up collaborative tasks in three dimensions, and the gathering of information on construction techniques and systems practiced in civil residential construction.

230 Production of Concentrated, Sterile, Liquid Culture Medium, for Cultivation of Leptospire Strains

Coordinator:
Rui Vadik Abrão

Company:
Bio Pronto Indústria e Comércio de Produtos Biológicos Ltda.

Approved value:
Phase 1: R$ 67,269

Leptospirosis is an urban disease, associated with the presence of rodents, which appears with greater intensity in large centers and mainly in the rainy seasons (Silva, 1994; Ministério da Saúde, 1997). It is an epizootic, which has a variety of serovars associated with some species of animals, as for example, serovar canicola in dogs, serovar pomona in pigs, *icterohaemorrhagiae* in rodents and *wolffi* in bovine animals (Baranton et aI., 1995). Considering the importance of leptospirosis in our environment, the present work aims to prove the technical viability of developing a formulated culture medium, containing proteins, vitamins, mineral salts and diluent. It is important to highlight that leptospires do not use sugar as a source of energy, so it is necessary to replace it with another element. The production of a culture medium, for the cultivation of leptospire strains, in ready-to-use, concentrated, sterile, liquid form, will be standardized and assessed for sterility and fertility against a battery of 22 reference strains of leptospirosis, approved by the World Health Organization (WHO). The presentation of the product in concentrated and sterile form will have all the indispensable nutrients for the cultivation of the bacteria, needing only to be diluted in sterile distilled water (Ph 7,3-7,4). The largest users of this culture medium are scientific research laboratories belonging to public institutions, clinical analysis and research laboratories established in universities, and productive industries which produce vaccines. The intention is also to export the product to businesses, research centers and universities in several countries.

231 Improvement and Expansion of Software Platform for National and International Dental Health Market

Coordinator:
Sergio Aronis

Company:
Aronis Engenharia e Sistemas Ltda (Dentalis Software)

Approved value:
Phase 1: R$ 74,708.70
Phase 2: R$ 265,265

Dentalis Software has more than ten years' experience in the development and commercialization of dental health programs in Brazil, with four products which cater for more than 8 thousand dentists. The market for dental services is in full expansion in Brazil. Ninety-seven per cent of the population has caries and only 3 million people have dental plans, compared with 43 million with health plans. The expansion of dental services is occurring by means of rising numbers of qualified dentists (14 thousand per year), the increase in the number of dental health plans (more than 1 thousand) and the increase in the number of dental plans taken out. There is currently no technological platform to meet all the needs, including the requirements of the National Health Agency, ANS. Therefore, the aim of this project is to develop this technology to cater for the dental health plan market, integrate the system for dental surgeries with the health plan systems and make versions available in English and Spanish to cater for the external market. In phase 1 of the work, the company gathered information in the field and developed and tested a prototype for market research, identifying in this way the majority of the requirements of the system. Based on this information, in phase 2 of the project, it is intended to carry out the improvement and expansion of this technological platform to cater for the demand of dental health plans and multi-clinics. In addition to management functions, these processes aim to provide subsidies for the establishment and oversight of Preventative Policies in Dental Health.

232 Optimization of the Production and Formulation of Biocontroller of Phytopathogens

Coordinator:
Teresa Jacoba Cesare Vidaurre

Company:
Cyrbe do Brasil Ind. Química Ltda.

Approved value:
Phase 1: R$ 54,092

Brazil is considered one of the largest producers of grain and fruit in the world, with agriculture one of the most important bases of the national economy. Nevertheless, some problems with fungi attacks, as well as a lack of infrastructure lead to considerable losses of production in the course of cultivation, harvesting, transporting and storing. The growing resistance of phytopathogenic fungi to chemical fungicides has increased the consumption of these chemical pesticides in the control of the fungi, causing serious damage to the environment. The use of micro-organisms to control phytopathogens could be direct, when the micro-organisms are used live, or indirect, by the application of their metabolytes. In both cases it is necessary to source products which maintain the characteristics of the microorganisms or their metabolytes. Thus, these products need to be adequately formulated to facilitate commercialization, transport, application and storage, without great changes occurring to their characteristics. The resistance of metabolytes produced by *Bacillus subtilis* to heat and the formation of highly resistant endospores, are excellent characteristics for the commercial development of formulations of this bacteria. In this undertaking, the objective is to launch on the Brazilian market a biological product for the control of pests and fungal diseases in agricultural crops and in post-harvested fruits of economic interest. Processes were developed for the production by submerged fermentation of a biocontroller of phytopathogenic fungi derived from *Bacillus subtilis* progeny, isolated from Brazilian ecosystems, with proven antagonistic activity towards phytopathogenic fungi and mycotoxigens. Currently we are testing the application of the product for the treatment of several crop plantings.

12th BIDDING INSTRUCTIONS

233 SIGE - Integrated System for the Strategic Management of Business

Coordinator:
Arnaldo Ferreira Sima

Company:
SIMA Internacional Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 6,562

This project aims to develop an integrated system with support tools for the activities of planning and managing business at the strategic, tactical and operational level. The objective is to elaborate a system which permits the complete integration of these activities, filling a space that exists in the information technology market. SIGE aims to establish a management environment which allows the decision maker to monitor and simulate the evolution of competitive scenarios and the performance indicators of the business, in a dynamic way and in real time, on the basis of information that is both internal and external to the organization. The system should also act as a facilitator in the process of establishing strategies and concepts of management (for example the balanced scorecard), in the presentation of best business practice (templates and role models) and in the management of strategic knowledge in the organization. SIGE should operate integrating the concurrent information of management systems, of management information, of the support tools for strategic planning and market information, and the other systems and databases within the organization. It should support the setting up of a strategic/managerial management cockpit which allows the decision maker to monitor and simulate the behavior of indicators and business scenarios.

234 Optical Fiber Sensors for the Detection of Chloride in Concrete Structures

Coordinator:
Claudio Oliveira Egalon

Company:
C. O. Egalon Consultoria

Approved value:
Phase 1: R$ 72,610

The company intends to develop, in collaboration with the Chemistry Department of the Paulista State University (Unesp), in Araraquara, a new fiber optic sensor for determining the presence and concentration of chloride ions in concrete structures. The sensor will have a spatial resolution of up to 5 millimeters and will provide a reliable form of determining the concentration of chloride ions in a concrete structure, indicating the moment at which that structure should be repaired. In this way, it may even forewarn of its collapse on account of corrosion caused by chloride in the metal framework of the structure. The main cause of this corrosion is the diffusion of chloride ions within the structure. These ions occur in sea water and in the chemical materials used to melt ice (de-icing agents) formed on bridges and roads in cold regions. The proposed sensor consists of an optical fiber the whole length of which is entirely sensitive to chloride ions, forming what is known as a distributed sensor. The sensor can be inserted into the concrete structure to detect the incursion of these ions. It consists of a glass nucleus and a covering made from a fluorescent material, the spectroscopic properties of which are modified in the presence of chloride ions enabling the device to generate a diagnosis swiftly.

235 Development of New Technologies for the Multiplication of Bananas in High Volume Bioreactors

Coordinator:
Clemência Noriega Söndahl

Company:
Bionova Mudas e Plantas Ltda.

Approved value:
Phase 1: R$ 40,300
Phase 2: R$ 46,868

Brazil is a large producer of bananas, however the cultivation of the fruit is still practiced in the traditional manner, using few higher quality *in vitro* seedlings. The main objective of this project is to develop a more efficient method of banana micro-propagation and, in this way, make viable the availability of healthy seedlings for new plantings, at lower costs. Seedlings multiplied *in vitro* produce 30 per cent more than conventional ones due to their better origin (selected plants) and their healthiness (being free from systemic diseases). Another of this study's objectives is to evaluate the performance in the field of banana seedlings produced in bioreactor, of seedlings produced in solid medium and of seedlings produced by conventional *ex vitro* method. It is hoped in this way to demonstrate the advantages and viability of a more efficient and cheaper multiplication of healthy banana seedlings. Productivity and cost of production figures will be collected for the three types of seedling being tested. The cost of manpower is responsible for 60 to 70 per cent of the final cost of *in vitro* seedlings.

236 PABX over Local Network

Coordinator:
Dagoberto Agenor de Sousa

Company:
E+I Engenharia da Informação Ltda.

Approved value:
Scholarship: R$ 19,542.60

This project aims to study the viability of constructing a PABX System over an existing local network, using Voice over IP, the telephone terminals of which are linked to stations (personal microcomputers) and the control center of which is hosted on a server equipped with multiple interfaces with telephone lines of the Public Switched Telephone Network (PSTN) and, when the conditions exist, for a quality connection, interconnected to the internet. The project should lead to a Distributed PABX System, the implementation of which takes advantage of the local network of microcomputers existing in the companies for the purposes of reducing the installation costs and even justifying its economic advantage. Therefore, it is necessary to investigate, within the ambit of the project, the technical limitations of the components available in the businesses and define the minimum technical requirements and other conditions for their taking advantage of the setting up of the PABX over local network. The study should end with the implementation of a prototype with a minimum configuration, in which the basic features of PABX will be developed and tested, making internal communication and connection to the fixed network the priority, including the existing PABX, with the aim of verifying the technical viability of the project.

237 Model for Corporate Portal in the Brazilian Banking Sector

Coordinator:
Eduardo Henrique Diniz

Company:
Hiperlógica Informática e Educação Ltda.

Approved value:
Phase 1: R$ 18,400

The building of an infrastructure capable of coordinating the internal and external flow of the organization, to administer the structured part (transactional data) as well as the non-structured part (email and online publications) of the whole range of information provided for and consumed by the internal and external publics, is the great challenge for organizations which, like the banks, have a high usage of the Web environment. The corporate portal emerges therefore as a model capable of overcoming this difficult situation. An absolutely essential element of corporate portals is their capacity to provide an environment for the management of content. The volume of content is growing explosively and affects businesses as yet unprepared. The consequence of disorganization is one alone: the costs of publication increase significantly and the customers are left dissatisfied. The object of this project is to specify a model for a corporate portal for banks, which will also represent a non-functioning portal prototype, which will serve as a basis for the development, by the company, for a de facto prototype of this product. Another objective is the development of a business plan, with emphasis on the study of the market viability of the corporate portal for banks.

238 Production of Bio-Oil via Fast Pyrolisis of Agricultural Waste for Use as Fuel and Materials

Coordinator:
Edgardo Olivares Gomez

Company:
BIOWARE - Sistemas de Termoconversão de Biomassa Ltda.

Approved value:
Phase 1: R$ 70,224

The first phase of this project aims to carry out a technical evaluation for the production and commercialization of the products obtained by fast pyrolisis, principally bio-oil, from renewable national raw materials of vegetable origin (vegetable biomass). The Bioware pyrolisis process is versatile and uses technology of fluidized bed reactor on a pilot plant scale with a nominal capacity of 100 kilos per hour of polydisperse biomass to heat and devolatize rapidly the material particles, with the products of the pyrolisis (gases, vapors and pulverized solids) swept along by the same effect that produces the fluidization gas. In its first phase, the project envisages the implementation of three groups of tasks aimed at technical evaluation of the pyrolisis process. The first group involves improvements to the reco-

very and separation of liquids from the pyrolisis, from the burning of the pyrolisis gases and the measurement and control of operational and process variables (temperature, pressure, composition and escape of gases). The second group involves the technical evaluation of the pyrolisis process for the different operating conditions planned. The third group should study, in a preliminary way, the socio-environmental impact of the technology based on the results obtained for the different operating conditions planned.

239 Establishment of New Space for Agricultural Commercialization with Virtual Reverse Auction - AGRO VIRTUAL

Coordinator:
Ernesto Fernando Rodrigues Vicente

Company:
Deltacom Comunicações Ltda.

Approved value:
Phase 1: R$ 52,266

The general aim of this project is the development of a concept for the commercialization of the productive chain of fruit and vegetable farming by means of a technological tool which allows the use of the digital reverse auction format. In line with the world tendency, the initial focus of action is in the area of perishables. The proposal is to build a virtual trading exchange for the market garden industry, dealing with supermarket chains, convenience stores, importers and exporters and even small regional markets, without ignoring the first link in the chain – the rural producer. The proposed electronic market with the creation of a reverse auction makes available access to products and services of great commercial and social impact, highlighting a new business model for the agricultural sector based on the relationship of buyers, distributors and suppliers in the same transaction space. The creation of the Space for Agricultural Commercialization with Virtual Reverse Auction promotes the coming together of the agents of production and the demand markets, in a trading venue where the product, the distribution and the commercialization occupy the same virtual environment of relationships which involve producers, buyers, sales promoters and professionals from technical areas in joint, simultaneous and synchronized actions.

240 Development of Machine for the Fusion and Traction of Fibers for the Manufacture of Passive Optical Components

Coordinator:
Francisco Martim Smolka

Company:
Optolink Indústria e Comércio Ltda.

Approved value:
Phase 2: R$ 236,600

In the last few years a vast optical network has been built covering almost the entire world and which constitutes an infrastructure (backbone) on which rates of the order of tens of gigabytes connect huge hubs. The next stages will be the access network to link large users and the subscriber's optical network. As the capillarity of this network increases, greater will be the consumption of optical components. Despite the basic technology of optical couplers having been developed from the scientific point of view years ago, only today have relevant commercial applications begun to emerge in Brazil. The two main aims of this project are: first, to develop a new heat source for the fusion and pulling of optical fibers. And secondly, to develop a traction drive for fibers, incorporating active control of the pulling tension. In addition, the new equipment will have a more up-to-date control system, as well as high precision mechanics and an optical monitoring system in more than one wave compliment. The new heat source will act by heat transfer through special ceramics, so as to protect the fiber from direct incidence. This source will allow better control and reduction of the hot zone, making it possible to make components of a smaller dimension than the present ones. The active control of the tractioning tension of the fibers will enable an improved performance in terms of losses, as well as mechanical reliability, by means of the knowledge and control of residual tensions of the encapsulated fibers.

241 Development of Instrumentation for Optical Fibers

Coordinator:
Ildefonso Félix de Faria Junior

Company:
Optolink Indústrias e Comércio Ltda.

Approved value:
Phase 1: R$ 50,000
Phase 2: R$ 299,800

This project will progress the development of a family of instruments for applications in the field as well as in the laboratory. These instruments will be light sources and optical power meters with interfaces for access to computers. This functionality will permit the integration of these instruments, creating systems the applications of which will be geared towards the supervision of optical networks, which could be telecommunications or cable TV or even industrial complexes. Such systems will have the capacity simply to carry out remote monitoring to check for the presence or absence of optical signal, or will also be able to transmit and receive signals codified and transmitted by the MUX/DEMUX optical interface, operating at rates corresponding to fractions of E1 (2 megabits per second). This project proposes the continuation of the development of the instruments and the study of circuits for conversion of electrical signals into optical ones. The strategy will be centered on the development of parts (sources and receivers). Subsequently, the work will undertake the integration of the created elements. The integration of the instruments will be implemented by means of software to create systems with specialized functioning.

242 Universal Wake-up System

Coordinator:
Jesus Raindo Gomez

Company:
E+I Engenharia da Informação Ltda.

Approved value:
Phase 1: R$ 37,500

The Universal Wake-up System consists of the development of a system, which is independent and external to the telephone exchange which will facilitate access to the wake-up service. Access to the service will be effected from any type of telephone apparatus, fixed line or cell phone, simply by dialing or keying in an access number to the service. On accessing the service the user will initiate a normal telephone call which will be routed and end in the provision of an operator, attendant or Automatic Response Unit (ARU), equipped with attributes to give guidance on programming procedures, cancellation and verification of the service. The user will not use specialized procedures to request any function of the wake-up service. Requests will be made verbally or by navigating between options offered by the system. The connection of the Public Switched Telephone Network (PSTN) to the equipment will occur via subscriber line, trunk, PABX branch or a code or special number, depending on who is responsible for the commercial exploitation of the service. The connection of equipment to the PSTN will occur through automatic dialing of the number requested to receive a wake-up call.

243 Development of Multi-user Gas Chromatograph

Coordinator:
José Félix Manfredi

Company:
Tech Chrom Instrumentos Analíticos Ltda.

Approved value:
Phase 1: R$ 49,575
Phase 2: R$ 245,509

The objective is to develop a benchtop prototype of a gas chromatograph with the innovative feature of a removable column in a separate capsule. The introduction of the encapsulated column combines the traditional advantages of the technique and the innovative features of an instrument which can be used without the operational restrictions found in traditional equipment. The capsule containing the chromatographic column will have an entry connection and an exit connection for the entrained gas connected respectively, to the injector and the detector, by a shielded snap connector system manually operated, requiring no tool. The gas chromatograph will have a miniaturized heating system which will enable the direct heating of the column in the interior of the capsule. The confinement of the heat source will make the equipment safe for locations with a potentially dangerous atmosphere. The instrument applies the concept of separable capsule, containing the analytical column arranged in spirals, through the interior of which the entrained gas (mobile phase) circulates, with air at controlled temperature circulating between the spirals of the column. The small volume of the cap-

sule will permit temperature gradients unattainable in conventional instruments, better control of the thermal air bath, better reproducibility of programmed conditions and rapid cooling.

244 Development of Integrated System for the Production of High Quality Strawberry Seedlings in Protected Cultivation and Sterile Substrate

Coordinator:
Keiji Roberto Nakashima

Company:
Plantech - Centro de Produção Vegetal Ltda.

Approved value:
Phase 1: R$ 43,850
Phase 2: R$ 104,221

Strawberry production in Brazil is estimated at 40 thousand tons, over an area of around 1500 hectares, with the State of São Paulo being the main producer. Almost all the production in the State is done in the regions of Atibaia, Jarinu and Piedade. Despite there having been an increase in the area planted, a drop in productivity has been noted, related mainly to the unsatisfactory health of the plants. The phytosanitary problems arise from the inadequate management of some cultivation practices such as soil preparation, irrigation and quality of seedlings used. Strawberry is a crop that is fairly susceptible to diseases which attack the rhizome and root system, caused by pathogens in the soil. Fresh seedlings with bare roots originating in conventional cultivations are a great disseminating agent of this pathogenic organisms (fungi and bacteria), which can survive in the soil for long periods of time and affect new plantings. The present project aims to develop a production system in which seedlings produced *in vitro* will be cultivated in a protected environment and in a sterile substrate to guarantee that their phytosanitary quality is maintained when they are transferred to the field. The use of techniques of micro-propagation combined with the advantages of cultivation in a substrate without soil throughout the entire production chain of seedlings will avoid contamination from soil. Starting with healthy seedlings should greatly minimize losses from disease, in addition to savings on defensives, thus reducing the environmental impact.

245 System for Satellite Earth Stations of Natural Resources

Coordinator:
Leila Maria Garcia Fonseca

Company:
Gisplan Tecnologia de Geoinformação S/C Ltda.

Approved value:
Phase 1: R$ 67,808.64

This project's main aim is to develop an architecture for earth stations to process data transmitted by satellite on natural resources. The new series of CBERS satellites, 3 and 4, will carry substantial technological innovations compared with numbers 1 and 2. Instead of continuing to make sizable investments, as occurred with the first two satellites, to obtain solutions always dependent on the supplier, the National Institute for Space Research, Inpe, intends to invest in the modular system developed on the PC+ Linux platform. The basic principle is to use as much open software from the operating system to the compiler, covering control tools for version, management of modifications and bugs, including the data base. In this first phase of the project simulations will be carried out to ascertain the possibility of using microcomputers in the earth stations. They will have to support a load of up to 150 megabytes per second and carry out the process of formatting data, inventory and data transfer by magnetic medium in less time than two consecutive sweeps of the satellite (around 100 minutes). The earth station system will be modular in both senses: functionalities and system sensors. As opposed to the present case, the new system will permit the addition of new satellites or instruments, in line with the plug-in philosophy.

246 Wind-up Free-fall Simulator

Coordinator:
Luciano Tanz

Company:
Dynamis Indústria e Comércio Ltda.

Approved value:
Phase 2: R$ 292,782

The Wind-up Free-fall Simulator is a free-fall simulator for people based on the generation of a high velocity ascending airflow. At present the 20 ton mobile version is being built on a 15 meter long trailer to which high efficiency, low noise, great mobility, safety and comfort will be added. Despite the existence of similar equipment, the combination of all these features in a single piece of apparatus was not possible until now due to technological limitations. A vast national and international bibliography was collected on the subject of load in various wind tunnel elements. Assisted by parachutists, we also collected a vast amount of data on jumps which, after being processed by specially developed programs, allowed us to establish parameters for people weightlessness in terms of weight, height, position and type of clothing. With this data it was possible to simulate the tunnel on the computer and optimize its aerodynamic to improve energy efficiency. Propellers of 2.7 meters and 11 blades were specially designed for this equipment, aiming for high efficiency and low noise levels. One of these propellers has now been made. The design of the propeller and the acoustics were done in conjunction and a sub-product was created for the attenuation and insulation of low frequency sound. Wind-up is a cheap and safe means of training for sky-diving.

247 Development of Equipment for the Electro-chemical Recovery of Gold from the Watery Effluent of the Bijouterie Industry

Coordinator:
Luiz Carlos Ferracin

Company:
Realen Folheados Ltda.

Approved value:
Phase 1: R$ 47,230
Phase 2: R$ 105,595

In the city of Limeira, in the state of São Paulo, is concentrated a national pole for the production of bijouterie (semi-jewels), where around 400 small enterprises generate and discard, daily, industrial effluents with a high load of metals into the river Piracicaba. Generally, in the semi-jewel production process effluents are formed containing heavy metals (copper, nickel, zinc, cadmium and others) and gold deriving from degreasing baths and metal plating from the successive phases and the waters from the washing of pieces between one stage and another. The effluent with the metal impurities is treated conventionally through chemical precipitation, an unprofitable and inappropriate process. This work intends to develop and optimize an electrochemical reactor aimed at recovering gold from the effluents generated by the semi-jewel industry, replacing the present chemical process. To do this, it is intended to place the metal with a high deposition speed in a region of potential/current in which the reduction reaction will be controlled by mass transport, aiming to obtain a thick layer of gold and low adherence to the cathode surface. The low adherence of the gold deposited will facilitate its later mechanical removal, which will make it detachable from the electrode surface. With this aim, it is intended to evaluate different materials for the cathode in this type of process: stainless steel, copper and tin, among others.

248 Development of Continuous Process for Incorporation of Vegetable Fiber in Thermoplastic Matrixes

Coordinator:
Miguel Luis de Souza

Company:
Newtech Assessoria, Consultoria e Prestação de Serviços S/C Ltda.

Approved value:
Phase 1: R$ 45,500

The objective of this project is to develop a continuous process for the incorporation of vegetable fiber in thermoplastic matrixes. This innovation involves the development of two prototypes. The first for a multifilament extrusion head and the other for a granulator of composites with vegetable fibers (sisal fibers), also for multifilaments. These two prototypes are part of the development of an exploratory production line for the manufacture of composites with sisal fiber. The prototypes to be developed aim to define design conditions for the head and matrix, as well as flow conditions of the materials (rheology). It is expected that the production line will be optimized and the composites produced will be characterized regarding their physico-mechanical properties. The mechanical properties should be improved, once the incorporation time of the fiber into the thermoplastic matrix is fast enough, ta-

king around one second. With this innovation, degradation of the fiber caused by the heat and by the shearing is minimized, appreciably improving the final properties of the composites obtained. The new production system for these composites permits the direct use of injection molding, giving the finished product the desired format.

249 Development of Equipment for the Electrochemical Treatment Hospital Sewage

Coordinator:
Orlando José Bratfich

Company:
Bluepoint Ambiental Ltda.

Approved value:
Phase 1: R$ 44,806
Phase 2: R$ 238,517

Hospital sewage is composed of human dejecta which, since they are in an environment prone to the development of diseases, carry a high number of pathogenic and multi-drug resistant pathogens. Among them we can mention *Staphylococos aureus* and *Enterococos faecalis*. Also present in this effluent is the water from washing contaminated materials and the waste from the cleaning of surfaces and floors, among others, particular to hospital activity. The central aim of this project is to transform the process of electrochemical and photo-electrochemical oxidation of hospital sewage into a commercial process which: 1. does not demand the addition of any chemical reagent or subsequent biological treatment; 2. does not generate sub-products which require new inertization treatments; 3. have a faster kinetics than biological treatments; and 4. occupy a smaller physical space. In phase 1 of the work, electrochemical technology was applied for the treatment of sanitary sewage deriving from the Center for the Complete Care of Women's Health, annexed to the Hospital de Clínicas of the State University of Campinas, Unicamp. The results were excellent and promoted the inactivation of the pathogeny present in the solution in 10 minutes, using a low density of current. In the second phase a station will be built for the electrochemical treatment of the hospital sewage at the same Center, which will remain in operation during the two years of the project.

250 Multi-Satellite Modular FIEEL - Hardware for Control of a System of Uninterrupted Supply of Electrical Energy

Coordinator:
Marcos Antônio Vieira da Silva

Company:
Eletro Máquinas Comércio e Representações Ltda.

Approved value:
Phase 1: R$ 74,700

The interruption of the energy from the Public Grid, RPEE, is a constant threat for small, medium and large consumers. The simple acquisition of a generator with a motor does not do away with the threat of interruption of supply. The submitted project aims to effect the automatic switching on/off of a generator and also carry out the automatic change-over between the energy coming from the Grid (RPEE) and the energy produced by the generator to meet a demand. The hardware was conceived to be easily installed in various pieces of equipment existing on the market. Besides this, the project implements two more innovative functions. The first concerns the monitoring and remote access for the diagnosis, prevention and alarm in generator failures, allowing for the automation of the preventative maintenance of failures in the generator park installed in the field. The second function concerns the intelligence of the selection of loads in response to requested demands. The project proposes that the control and activating functions of the generator motor and the electro-mechanical or electronic change-over of energy between the Grid and the generator be implemented by a proprietary application-specific integrated circuit (ASIC). Other functions (for example, remote communication) should be carried out by commercial circuits, among them microprocessors.

251 New Support System for Decisions on Prices, Quotations and Costs for Small and Medium Enterprises

Coordinator:
Reinaldo Pacheco da Costa

Company:
PPE Engenheiros Associados S/C Ltda

Approved value:
Scholarship: R$ 19,542.60

This project aims to develop models and algorithms for optimization in the areas of applied economics, finance and production engineering with interest in the management of operations in small and medium enterprises. The proposal aims to study the technical viability of reformulating the costs and prices management system (POCR), already developed by PPE Engenheiros, to make it more flexible and less specialized. This involves a task that will require a certain technological effort, since the intention is to make operational models and methods of considerable complexity, namely the models of activity based costing (ABC). The broad objective is to permit small and medium industrial enterprises to be able to model a customized costing system for their needs and to be able to draw from it relevant information for their financial management. The focus is not just on the development of conceptual models, but also on the analysis of real cases. Phase 1 of this project includes, among its main activities, technological research and the collection of data on small industry, the research into models of financial management practicable in small and medium industries and research into applications currently available on the Brazilian and international markets aimed at medium and small businesses to ascertain which aspects are covered today by existing solutions.

252 Production of a Porous Body by Means of Agglomeration of Fines of Active Carbon, to be Used as Filter and Absorbed in Water Treatment

Coordinator:
Silvio Benedicto Alvarinho

Company:
Elementos Filtrantes Prisma Ltda.

Approved value:
Phase 1: R$ 28,750

The aim of this project is to develop a process for the production of porous bodies made up from the agglomeration of active carbon fines (carbon block). The proposed process uses as binder phenolic resins and, by thermal treatment at high temperatures, promotes the carbonization of these resins to produce a carbon-carbon composite which retains no traces of the components of those resins, forming carbon block which produced in this way is suitable for the use of the treatment of water for human consumption. The proposal is also to define the adsorption properties, of this carbon block, of organic chemical compounds which may be contained in waters supplied for consumption by treatment stations. In Brazil, lack of knowledge concerning levels of these contaminations is considerable, but certainly they are bound to exist in a high degree and are derived from high levels of pollution caused by agricultural defensives carried into the rivers from which many cities take their water for human consumption.

253 Biocompatible Metal Implants

Coordinator:
Spero Penha Morato

Company:
Lasertools Tecnologia Ltda.

Approved value:
Phase 1: R$ 16,690 / US$ 15,050

The objective is to develop methods and processes for the manufacture of biocompatible metal implants using laser. In the short term, this innovation is focused specially, but not exclusively, on five products: stents (vascular dilators), distractors (bone lengthening), titanium meshes, clips for aneurysm and spinal implants. With the results of these developments, the intention is to nationalize the manufacture of these components aiming to offer high quality products at a lower price than similar imported products. In the medium term efforts will be directed toward the flexibility offered by manufacture by laser, allowing for new alloys and new designs to be tried out quickly, using our CAD/CAM skills also for treatments which permit the insertion of medicines, or even the use of radioactive alloys.

13th BIDDING INSTRUCTIONS

254 Research on Fuel Purifier Device

Coordinator:
Alberto José Schmieliauskas

Company:
Pentagrama Desenvolvimento de Processos e Projetos Ltda.

Approved value:
Phase 1: R$ 31,715

Owing to limitations in the transport and storage process of diesel, fuel is exposed to contamination with solids, such as rusting, and with liquids, mainly water in condensed and emulsified form. In addition to causing environmental problems, these contaminations affect the efficiency of the combustion and also decrease the useful life of the injection and explosion system, such as the injection pump, fuel injectors and combustion chamber. After 30 years studying the phenomenon, a filtering system capable of keeping back the water mixed in with the fuel was developed and patented. The separation principle takes advantage of the bipolar characteristic of water molecules using a chemically ionized filtering element. In its first stage, the objective of the research, based on the patented filtering technology, is to prove that the filtering element bathed in the selected chemical produces the desired effects of separation of solid particles and liquids (water) from the diesel oil, in an environment that simulates the discharge and the pressure of a working diesel engine. For this purpose, controlled tests will be carried out in purifiers constructed in the laboratory, using commercially available materials, without legal and environmental restrictions and at a market compatible cost.

255 Network Quality Management System – HORUS

Coordinator:
Aldemar Fernandes Parola

Company:
AsGa S/A

Approved value:
Phase 2: R$ 237,763

This involves the development of a specific management system to gauge the quality of a network of telecommunications services, as well as to compile information which might permit the elimination of losses of income related to faults or frauds and serve as a support tool in the process of planning and decision making. This system uses information obtained by ordinary signaling connection control (CCITT Nº 7) to produce diagnoses in relation to quality of service offered, enabling the quality indices laid down by the National Telecommunications Agency to be calculated. The main elements to be developed are: 1) signaling Processor PS-64; 2) pre-processing node software (BD-Pre); 3) post-processing node software (BD-Post) and centralized CDR database (Call Detail Record); 4) software for consultation and report generation (HORUS). In addition to the development of these elements, studies will be undertaken relating to the scalability, modularity, redundancy and reliability of the computers (BD-Post) that will process the signaling messages to generate the CDR and the centralized CDR database. This stage of the project also envisages the acquisition of five Remote Unit (RUs) kits consisting of equipment items CE nx64, PS-64 and BD-Pre in order to carry out tests alongside operating companies. Owing to the size of the centralized data file (in the order of tens of terabytes), it should be the object of internal tests and with several operators so as to guarantee its good performance when working at full load.

256 Computational System for Reduction of Losses in Energy Distribution Networks with Virtual Reality Interface

Coordinator:
Antonio Valério Netto

Company:
Cientistas Associados, Comércio, Representação, Consultoria e Treinamento Ltda.

Approved value:
Phase 1: R$ 19,079.90

The focus of this project is the development of a computational system for the reduction of losses in energy distribution networks (urban networks) by means of advanced computational algorithms of circuit reconfiguration. The results deriving from the application of this system should be, among others, an increase in billing for the energy distribution companies and better use of the energy generated in the country. It is estimated that the Brazilian energy distribution segment dissipates 52 per cent of the total losses of the system, at an annual cost of around 1.5 billion dollars. The development of computational algorithms to reduce these losses by means of the reconfiguration of the network is extremely complex. In this context, it is proposed to apply the Evo-

lutionary Algorithm with Representation in Graph Chains (EA with RGC) (Delbem, 2002), to solve the problem. EA with RGC has proved to be capable of drawing up adequate restructuring plans for relatively large networks, using small computing times. Besides this development, an efficient man-machine interface is extremely important to drive the work with a large quantity of data generated by a distribution system and to facilitate the interpretation (assessment) of the solutions proposed by the system. The proposed interface is based on Virtual (immersive) Environments, which have brought about huge revolutions regarding man-machine relationships both in the solution of scientific problems as well as industrial ones.

257 Development of a National 5Kw Aerogenerator

Coordinator:
Cassiano Nucci Paes Cruz

Company:
Eletrovento Ltda.

Approved value:
Phase 1: R$ 37,069

The objective of this project is to develop a 5 kilowatt aerogenerator, the market potential for which is estimated at 70 thousand units in the country. The initial phase of the project will involve the technological development and prototype tests (proof of technical viability) of the two essential parts of the aerogenerator: the design for the propeller and the electricity generator. The second phase envisages the production of the best-in-class model for which the other parts of the wind generator will be designed, based on technology being developed by Eletrovento. In the area of aerodynamics, using WingAnalysis Plus software, all the surfaces of the blades will be designed in CAD. A prototype on a reduced scale will be built in fast-prototyping machines, since in real size it should measure around 6 meters in diameter. This prototype will be tried in the field for the collection of data on rotation curves and torque in relation to wind velocity. In the area of electric machines, a generator will be designed with permanent magnets with several poles (probably 18) so as to be efficient at low rotations (300 to 1000 rotations per minute), atypical for electric machines. A prototype will be built to be tested on a bench that has a variable speed motor which simulates the propeller action. Since the application of the generator is aimed mainly at charging batteries, an electronic power rectifier circuit and a tension regulator will also be designed and tested.

258 Integrated Computational Platform for Teaching, Research and Development of Telecommunications and Electronic Instrumentation

Coordinator:
Dalton Soares Arantes

Company:
Treinamento Consultoria Projetos e Pesquisa em Telecomunicações Ltda.

Approved value:
Phase 1: R$ 66,600

The aim of this project is to develop an integrated and reconfigurable computational platform for teaching, research and development in telecommunications and electronic instrumentation. The methodology comprises the initial prospecting and detailed examination in search of information on possible solutions offered on the market. There will be a comparative study of sensors, AID and DIA converters and the available interfaces. It is intended to design and develop a basic prototype and to undertake a search for possible applications based on the proposed platform, which will be developed in later stages. The methodology to be followed also envisages laboratory tests to prove the technical performance and the drawing up of a business plan. Two high performance computers based on the Pentium 4 will be made available for the development of the initial prototype of the platform. Signal acquisition boards WR-1550i, PCI-DA4020/12 and NI 5911 will be purchased. The anticipated result of the first phase of this project is proof of the technical and economic viability of the platform to be developed. In this ambit, it is hoped to define specific niches in the telecommunications market for products based on the platform, such as test instruments for communications systems.

259 Wireless Optical Communications System

Coordinator:
Elso Luiz Rigon

Company:
FiberWork Comunicações Ópticas Ltda.

Approved value:
Phase 1: R$ 36,500 / US$ 11,500

The objective of this project is to develop in Brazil fiber-less optical communications systems. Communications systems for applications in telecommunications access networks, cell phone backhaul networks, interconnection between company LANs and internet access providers. The system will operate at a transmission rate of 2 megabits per second (Mb/s), in the window of 1550 nm, with reach from 500 meters (phase 1 of the project) up to 4 kilometers, with 98 per cent availability. In the future, systems with higher rates, such as 8 Mb/s and 34 Mb/s will be developed. Free Space Optics (FSO), or optical communication without fiber, is growing and will occupy a prominent position in the next few year, as it transforms itself into the main alternative to broadband access in metropolitan environments. Probably, it will surpass radio systems and, in many situations, fiber optics. FSO systems of higher rates are more competitive today, since the alternative would be fiber, which is much more expensive and involves licenses and high installation risks. Low rate FSO systems could also enjoy similar success. In this case, they would unseat radio access systems. It is in this niche that FiberWork seeks to position itself with the proposal of this technological development project. The rate of 2 Mb/s (E1) was chosen for the initial project in response to market demand.

260 Development of New Infrared Movement Detection Sensors for Domestic and Business Security Applications

Coordinator;
Giuseppe Antonio Cirino

Company:
Eletroppar Indústria Eletrônica Ltda.

Approved value:
Phase 1: R$ 73,649

This project aims to develop and manufacture new passive movement detection sensors. In the world market, many of these sensors do not operate in a robust manner in the detection of standards of variable sizes, as, for example, the silhouette of a human body or of small to medium size animals. Sensors on the market today carry out this task (pet immunity) only very approximately, or merely so as to minimize the problem in situations in which different body masses generate similar signals. To get round this problem, a new hybrid concept called wave front coding is used. This combines optics and electronics aiming for an improvement in the system's performance and reducing the final cost of the product. In phase 1 of this project the bench top prototypes for the presence detectors should be assembled, to show the technical and economic viability of the idea. In phase 2, the sensor will be encapsulated with the technologies developed in the first stage, bearing in mind the assembly line processes already existing in the company. At the end of the project, the intention is to have mass production of the sensor and to launch it on the market by means of an appropriate marketing strategy. Even with the inevitable increase in its price, it is believed that the innovative imbedded technology will be quite superior, so that the product will still remain competitive.

261 Band S Transmitter to Integrate Doppler Meteorological Radar System

Coordinator:
Jean Claude Lamarche

Company:
Omnisys Engenharia Ltda.

Approved value:
Phase 2: R$ 167,228

The objective of this project is to develop a band S radar-transmitter and integrate it to the Doppler Meteorological Radar System under development in Omnisys and to propose a modernization solution for all the obsolete radar systems currently installed. The classic radar-transmitter consists of four fundamental modules: the synchronous generator, the power supply, the pulse modulator and the high frequency emission element. Classic modulators use a delay line as an element for storing energy. Although reliable, they only have a single pulse length per delay line, as opposed to the need, in many applications, for this parameter to be easily adjustable. The modern solution for this deficiency was to develop a radar-transmitter entirely in solid state. Transmitters of this kind are, however, extremely expensive when compared to the classic ones and hardly viable for civil applications, especially for the market in focus. Therefore, the intention is to explore the low cost and high reliability of the magnetron-type emitter,

developing a commutation circuit which does away with the use of delay line and enables easier regulation of the length of radar pulse.

262 Band S Receiver to Integrate Doppler Meteorological Radar System

Coordinator:
Jorge Hidemi Ohashi

Company:
Omnisys Engenharia Ltda.

Approved value:
Phase 2: R$ 250,092.40

The basic objectives of this project are: to develop a band S receiver to integrate in the Doppler meteorological radar system, under development in Omnisys, and to set up a team that is specialized and trained in the development of new products which involve similar knowledge to that acquired during the implementation of the project. The classic radar receiver is of the superheterodyne type with phase coherence and the use of linear amplifiers for the extraction of video signals. The transmitted signals which return to the receiver present very low amplitudes and are amplified by a low noise amplifier which is characterized by a high gain and low noise figure. This signal is then amplified and converted into an FI frequency of 30 megahertz (MHz) by means of a mixer which emits a pulse between the transmitted frequency and that of a high stability local oscillator (STALO). The frequency of the local oscillator can be syntonized 30 (MHz) above the transmitted frequency (supradyne) or be syntonized 30 (MHz) below the transmitted frequency (infradyne). The mode of operation to be used in the present project is supradyne. Phase coherence is also very important during the process of extracting the video signals. The synchronous transmission signal which marks the start of the transmission and the cadence of the radar's interrogations is present in the receiver so as to synchronize the video extraction. This synchronous signal is used as a reference of the oscillation circuit in 30 MHz known as COHO (oscillator coherence), in order to maintain the same phase of the transmitted signal. In the logarithmic amplifying circuit the FI signal is amplified and the logarithmic video signal extracted which is used to generate the AGC (Automatic Gain Control) used to centralize the linear amplifier's dynamic so as to control the gain. In the linear amplifying circuit the FI signal is amplified and, by means of a mixer which emits a pulse between the FI and the COHO signal, the signal for linear videos I and Q is extracted which are in phase quadrature to resolve problems of ambiguity. Due to the fact that the Magnetron valves alter their oscillation frequency with the passage of time, an AFC (Automatic Frequency Control) circuit is required which, by means of a comparison between the frequency transmitted and that of the local oscillator, ensures that the FI frequency is maintained at 30 MHz; if there is any alteration, an error signal is generated. There are two possible ways to maintain the FI frequency. The first is to use the error signal generated by the AFC, adjust the Magnetron, and correct its transmission frequency; and the second is to use the error signal generated by the AFC and adjust the local oscillator correcting its frequency. The receiver to be developed will use the option of correcting the frequency of the local oscillator.

263 Administration and Integration of Information for Decision Taking on Enterprise Resources in Small and Medium Businesses, Using Automated Management Tool, Providing Diagnostics and Administrative and Operational Agility

Coordinator:
José Antonio Neves

Company:
AES - Application Express System S/C Ltda

Approved value:
Phase 1: R$ 31,672

In the struggle for market share companies must, increasingly, search for greater agility in the processes of decision taking, in order to make their productive systems more efficient and provide products at competitive costs. Considering the huge amount of information involved, it is necessary to create mechanisms which permit diagnoses to be obtained, in real time, and even simulations of operational conditions so that decisions are more appropriate and potentially more lucrative for the business. Large companies invest millions of *reals* on establishing and contracting specialized systems and services which assist not merely in managing their businesses. The object of this project is to demonstrate the technical viability of the development of a specialist automatic solution in the administration of enterprise resources with the characteristics of being easy

to use, of low cost, compatible with the budget of small and medium companies. Focused on the business segment and adapted to the developmental aims of the contracting company, the project will develop an administrative tool based on software specialized in decision taking, an infrastructure related to applications aimed at data capture in existing systems, and develop small programs for the management of strategic information.

264 Development of Thermoluminescent Dosimeters

Coordinator:
José Carlos Borges

Company:
MRA Indústria de Equipamentos Eletrônicos Ltda.

Approved value:
Phase 1: R$ 56,940
Phase 2: R$ 81,260 / US$ 30,033.50

This project aims to industrialize a product that is compulsorily used by more than a dozen direct users, namely the institutions which provide radiological monitoring services, and around 50 thousand indirect users: workers exposed to ionizing radiation. The principal means of controlling these exposures is the individual monitoring and vigilance over levels of radiation in work areas by means of detectors called dosimeters. The most commonly used currently are made from thermoluminescent materials, known as TLDs, the only manufacturer of which in Brazil is the Institute of Energy and Nuclear Research, Ipen, with which MRA has signed a technology transfer agreement. In the first phase of the project, innovations were concentrated on the solution of common obstacles to technology transfer processes which, in the case of CaSO4:Dy pellets, include aspects such as the assembly of installations and equipment in the pilot plant, the chemical techniques of obtaining the raw materials that make up the pellet and the quality control of the thermoluminescent characteristics of the dosimeters. The second phase will confront the technological problems currently experienced by those dosimeters, among which the sourcing of a more transparent and stable aggregating material (gels that can vitrify) to carry the thermoluminescent crystals, the incorporation of new dopants for refinement of the radiological sensitivity and new thermic treatment techniques to optimize the reusability of the dosimeter.

265 Radio-controlled Agricultural Model Plane

Coordinator:
José Roberto Rasi

Company:
Prince Air Models Ltda.

Approved value:
Phase 1: R$ 75,000
Phase 2: R$ 244,865 / US$ 10,020

This project aims to develop a radio-controlled agricultural model plane for the spraying of agricultural defensives, distribution of seeds and similar operations on rural properties. The model plane will be built from a composite (fiber glass, reinforced with mixed carbon and aramide fibers and epoxy resin) with a balsa wood frame, powered by a two-cylinder petrol engine with electronic ignition controlled by a radio control system, with nine channels and dual receiver, powering high-torque digital servomotors. The spraying system will initially have a 25-liter reservoir for defensives, with prevision to increase the capacity as the project is refined. The automatic flight stabilization system is envisaged as using a digital gyroscope with two axes which will automatically correct the flight, avoiding variations in the plane's altitude. The project also includes an automatic flight steering system to align the plane so that the spraying can be carried out in strips of terrain, without overlaps or missed areas, with the use of GPS (Global Positioning System) and microprocessors on board. In the second phase of the project two more planes will be built in composite, reproducing the model demonstrated to be viable in phase 1. The planes will be used for the development of flight control software and studies of spraying.

266 Band S Antenna Set to Integrate in Doppler Meteorological Radar System

Coordinator:
Luiz Manoel Dias Henriques

Company:
Omnisys Engenharia Ltda.

Approved value:
Phase 2: R$ 285,904.60

The objective of this project is two-fold: to develop a band S radar-antenna set controlled by a digi-

tal servo mechanism with a view to integrating it into the Doppler Meteorological Radar System under development in Omnisys, and to propose a solution for all the obsolete radars currently installed. The quality of the information received by the antenna depends on its speed of rotation, on the precision of its positioning, on the parameters of the radar pulse and on the gain characteristics, angular aperture, secondary lobes and beam format. One great difficulty found in the design of radar antenna sets was guaranteeing the information received with the increased gain from the antenna. This increase entails the use of ever larger, and yet more unstable, reflectors. Antennae with variable electromagnetic field came to be used in high power applications which demanded great precision. This solution, has shown itself, however, to be economically unviable for civil and short-range radar. The advent of digital technology allows for the adoption of new electromechanical micro-processed solutions which guarantee, at a low cost, high precision in the antenna's movement. The project seeks, however, to study new electromechanical solutions for the support of antennae and servo-mechanism controls, and to develop a new radar-antenna set using digital technology.

267 Development of Bio-insecticide Formulations Based on the Entomopathogenic Fungus Metarhizium anisopliae

Coordinator:
Marco Antonio Tamai

Company:
Bio Soja Industrias Químicas e Biológicas Ltda.

Approved value:
Phase 1: R$ 17,580
Phase 2: R$ 183,300 / US$ 7,228.93

The use of *Metarhizium anisopliae* for the control of *Mahanarva fimbriolata* (Stal) in the cultivation of sugar cane in the state of São Paulo has greatly increased over the last years. The objective of this project is the refinement of current techniques and the development of new production and formulation processes for *Metarhizium anisopliae*, produced in liquid and solid culture media, so as to raise levels of quality control and lower costs of production. To do this the following stages were outlined: 1) selection of complex and low-cost culture media, as well as sources of nitrogen, carbon and vitamins; 2) evaluation of the toxicity of inerts for liquid and solid formulations; 3) development of different types of formulations; 4) assessment in the field of agronomic efficiency of the selected formulations. In phase 1 of the project alternative and low-cost products were chosen (sugar cane molasses, glycerin, yeast extract and beer yeast) for the composition of the liquid culture media, with a view to the large scale production of different structures of the biological cycle of *Metarhizium anisopliae*. This information will be used in phase 2 for the development of new bio-insecticide formulations based on blastospore and dry mycelia to enable the use of mycelial mass as inoculum in biphasic systems of production of airborne conidia.

268 Biomaterials Based on Phosphates of Calcium Collagen for Reconstitution of Bone Tissue

Coordinator:
Marcos Roberto Bet

Company:
Pro-Line Serviços Produtos Odontológicos Ortopédicos Ltda.

Approved value:
Phase 1: R$ 36,480

The aim of this project is to develop ceramic- and collagen-derived materials in the form of membrane for use in mouth-jaw-face reconstruction. Its indication is associated with bone defects caused by the very pathology itself and/or by surgical treatment which results in defects such as bone cavities, mucous bone dehiscence, and gingival retraction associated with chronic inflammatory processes of the jaws, such as cysts, granulomas and other tumors. The proposed materials may also benefit patients with indication of tooth extraction and indication of immediate dental implant with concomitant need for graft. The ceramics proposed in this project are derived from salts of calcium phosphate and correspond to: 1) non-stequiometric hydroxyapatite (HA) for application in bone tissue reconstruction of small volume defects, and which in the form of green cake (raw preparation of HA) will be obtained by synthetic process, to replace similar materials which contain B-TCP and HA, the cost of which is higher in relation to processing; 2) biphasic ceramics (BCP) made of non-stequiometric B-TCP:HA which, on account of significant differences in solubility, allow for the formulation of ceramic preparations more suited to the volume of the reconstruction of tissue simply because of the variation in the

proportion of the two hemihydrated ceramics; and 3) injectable ceramics intended for mouth-jaw-face reconstruction to minimize ceramic migration.

269 Computational Analysis of Genetic Paternity Test

Coordinator:
Martin Ritter Whittle

Company:
Genomic Engenharia Molecular Ltda.

Approved value:
Phase 1: R$ 74,834

The genetic paternity test aims to establish whether a certain individual, the claimant, is the child of a second individual, the respondent. The tests most commonly applied in the courts today use DNA (Deoxyribonucleic acid) to assess the probability of family relationship in disputed judicial paternity cases. Nowadays there is a vast literature on cases on which genetic material of the respondent is available. In the absence of this information, there are few references in the specialized literature. The doctoral thesis of Luiz Montoya-Delgado addressed this problem, but despite the technical advance it represented, specific cases were described for which specific techniques were presented. The objective of this work is to develop an automatic calculation tool which encompasses every type of judicial request and which will be efficient even on a large scale and with data obtained from individuals with different degrees of kinship. The main activities will be: 1) use of bayesian nets for modeling and calculation of the probability of paternity; 2) development of a heredogram-bayesian nets compiler; 3) computational and mathematical treatment of the mutations in micro-satellites (STRs-Short Tandem Repeats); and 4) hardy-weinberg equilibrium test, by means of a new methodology of tests of exact hypotheses.

270 Development of Foams Based on Starch and Their Application as Eco-sustainable Packaging

Coordinator:
Patrícia Ponce

Company:
CBPAK - Embalagens Eco-Sustentáveis Ltda.

Approved value:
Phase 1: R$ 64,080

The proposal is to develop a process for production on an industrial scale of expanded starch foams for biodegradable packaging. The main deficiency in the technology of current processes is the sensitivity of the product to liquids, which precipitate immediate biodegradation and the destruction of its mechanical properties. Starch's ability to absorb water and its sensitivity to hydrolysis cause a big problem for large scale automatic production, as they make it difficult to formulate a stable raw material, which can yield reproducible expansion results. The project proposes the development of a starch foam with greater possible level of expansion, lower cost of production, totally soluble in water and biodegradable, preferably free from artificial additives, and also an adequate covering based on fatty and aqueous products. The processing equipment for the foam that will be designed and built by the project does not exist on the national or international market.

271 Establishment of Unit for Recovery of Foundry Sand Contaminated by Phenolic Resin by Heat Process

Coordinator:
Silvio Benedicto Alvarinho

Company:
Metalurgica Piacentini & Cia Ltda.

Approved value:
Phase 1: R$ 75,000

The metal casting industry in Brazil is beginning to take steps to reduce the negative impact of its activity on the environment. Efforts in this direction stem, in good part, from the recent passing of a new environmental law which lays down more severe punishments, but undoubtedly they are also related to a new vision on the subject on the part of business owners. The other consideration which should encourage foundries to look for means to regenerate the sand they use in their manufacturing processes is the high cost of waste, which hovers around R$ 70.00 per ton. In this project it is intended to design and establish a demonstration unit with a capacity of up to 1 ton per hour, for the recuperation of foundry sand contaminated with phenolic resins. Initially, an assessment should be undertaken in the region of Piracicaba, on the fate of the foundry sand contami-

nated with phenolic resin. The sand will be classified in accordance with Norm NBR 10004, in addition to classification studies regarding the sublimation and decomposition kinematics of the phenolic resin. It is also intended to carry out the physico-chemical characterization of the foundry sand using conventional analysis techniques, such as the use of the radioactive tracer technique to check on changes in the size of the sand particles contaminated during the heat treatment, making it possible to evaluate the efficiency of the proposed process.

272 Project for Frequency Filters Using SAW Technology for Application in Cell Phone Repeaters

Coordinator:
Serguei Balachov

Company:
AsGa Engenharia e Representações Ltda.

Approved value:
Phase 1: R$ 72,900

The objective of this proposal is to develop a software project for the analysis of the secondary effects of SAW filters with a high degree of side-lobe rejection and extremely low shape factor. Testing and refinement of the stages of the production process of filters for the latest generation cell phone repeaters will be carried out. The following propositions will be analyzed for use in this project: 1) new topology using sloping fingers to obtain desired response from the filter directly in the frequency domain; 2) new treatment of the reverse of the plate using grooves in saw-tooth configuration that guarantees the cancellation of volumetric waves in long band frequency; 3) new configuration of acoustic absorber to improve side-lobe rejection; and 4) analysis of the effects of micro-soldering on the electrical behavior of the filters. Samples should be produced based on the technologies developed and the results offered to potential customers in Brazil and abroad.

273 Development of Protective Polymeric Electrically Highly Conductive Films for Application on Electrochemical Energy Generating Devices and Manufacture of an Automatic Applicator

Coordinator:
Valdemar Stelita Ferreira

Company:
NovoFilme Componentes para Sistemas de Energia (ex-V.S. Ferreira Consultoria)

Approved value:
Phase 1: R$ 68,850.77

The project aims to refine two different formulations and the applicator equipment for aqueous polymeric emulsions with added graphite which, after drying, result in electrically conductive films, impermeable to ions or gases, thermically and chemically resistant for use in alkaline batteries and fuel cells. Formulation One will allow the replacement of solvent based films used in the alkaline battery industry for the internal coating of the nickeled steel casing, preventing the corrosion of the cathode collector. Such batteries have a heavy demand in the latest generation of electronic devices such as minidiscs, CD-players, digital cameras and electronic organizers. Variations of the properties described, applied in Formulation Two, will permit the reduction in the thickness of the present carbon/graphite bipolar separators used in fuel cells. These separators collect and conduct the current from the anode of a cell to the cathode of the adjacent cell, while they also distribute hydrogen gas over the anode surface and the air or oxygen over the cathode surface. The project will be carried out in three stages, which include the formalization of the procedures, various types of tests, acquisition of equipment and materials and development of the manufacturing technologies on a large scale, among other activities.

274 Fiber Optic Sensor for the Petroleum Industry

Coordinator:
Walter Américo Arellano Espinoza

Company:
FiberWork Comunicações Ópticas Ltda.

Approved value:
Phase 1: R$ 8,400

This project aims to investigate the use of Fiber Bragg Grating (FBG) technology to build Multi-phase Flow Metering (MFM) systems for oil wells. Once the technical and economic viability are confirmed in phase 1, phase 2 should work towards the technological development of prototypes of FBG-MFM systems. The function of these systems is to discriminate and measure the fractions of volume in triphasic flows mixing petroleum, salt water and gas. In the future, or in

case the development of FBG-MFM does not prove to be technically or economically viable, the project could be extended or redirected for FBG applications in other areas, such as: sensors for the aeronautical, naval, civil engineering (dams and bridges) and medical industries. Applications of FBG in the area of telecommunications – where this innovation finds the greatest variety of uses – could also be developed. Equally, the new professionals to be trained and the infrastructure to be installed for the working of this project should find an almost endless range of generation of inventions and technological innovations, all with high potential in terms of market and wealth creation.

275 Development and Nationalization of the Technology for the Manufacture of Clonazepam

Coordinator:
William Carnicelli

Company:
Alpha Produtos Químicos Ltda.

Approved value:
Phase 1: R$ 70,575 / US$ 70,575

The aim of the proposed project is the development of technology for nationalization of the manufacture of Clonazepam, a product used in the pharmaceutical industry in the preparation of anticonvulsive medicines consumed by patients who have neurological problems, principally epilepsy. The main manufacturer of these medicines is a multinational company which practically supplies the whole market with this specialty in Brazil. The local manufacture of Clonazepam will enable it to be offered to national laboratories, in general large manufacturers of generic medicines and the like, such as União Química, EMS, Sanval, Medley and Teuto, among others. The product to be developed will meet the quality standards of Brazilian, American, European and Japanese pharmacopoeia, allowing therefore for its export, principally to Mercosul countries. In its first phase, the project will conduct a research and development study into the best route for synthesizing Clonazepam on a laboratory scale, followed by its development on a scale of 20 liters. The next stage will be work on a 250 liter pilot plant, now in the pre-industrial phase.

276 Spectroscope for Teaching

Coordinator:
Yoshikazo Ernesto Nagai

Company:
Optron Micromecânica Óptica Ltda.ME

Approved value:
Phase 1: R$ 15,500
Phase 2: R$ 44,150

Experiments which show atomic emission spectra are an important part of a set which constitute the experimental foundations of Quantum Mechanics. These spectra are easily observed in a spectroscope, a relatively simple instrument composed of a lamp made from the element, the spectrum of which you wish to observe, and an optical collimator to collect the light from the lamp which passes through a narrow slit, directed at an optical prism, the function of which is to spatially separate the various discrete lines of different colors emitted by the lamp's atoms. These colored lines are observed through a refracting sight mounted on the moveable arm of a goniometer, permitting the measurement of the deflection angle for each line. The present project aims to manufacture the complete spectroscope, a set of spectroscopic lamps (hydrogen, helium, argonium, mercury and sodium) and their electronic sources of activation, the goniometer attached to the optical system for collection, separation and analysis of light emitted, and the recording of the spectrum in various ways (visual-manual, photographic and via microcomputer, among others). The proposal in phase 2 involves researching and developing a hydrogen lamp with the aim of achieving a minimum half life of six months, bearing in mind the known difficulty of maintaining its luminosity for any prolonged time. For the quantitative recording of the spectrum, a micromotor and a light detector will be added to the spectroscope built in phase 1 so that the luminous lines of the spectrum can be converted into electric signals capable of being processed electronically.

14th BIDDING INSTRUCTIONS

277 Development of Haploid-Inducing Populations for Commercialization of Double-Haploid Strains of Maize

Coordinator:
Fernando Fernandes de Andrade

Company:
Phoenix - Comércio, Importação e Exportação de Sementes Ltda.

Approved value:
Phase 1: R$ 47,100 / US$ 7,600

Maternal haploids are obtained, in maize, when haploid-inducing lines are used as a pollinator. The haploids' chromosomic duplication makes it possible to reduce by two to three times the occurrence of homozygote strains, compared to the traditional method. Practical experience with the use of maternal double-haploids has indicated that the strains obtained in this manner display, on average, greater combination capacity than those obtained by self-fertilization. The main objective of this project is to introduce in Brazil populations of maize with haploid-inducing genes, developed and used commercially in Europe and the United States. These inducing populations will be evaluated as for their adaptability for planting in the state of São Paulo, as for the agronomic and phytosanitary characteristics, and as to their comparative efficiency in the generation and identification of maternal haploids in tropical germplasma of hard and dentate grain. Techniques recommended for the chromosomic duplication of the maternal haploids will also be evaluated and a start made on intergression of haploid-inducing genes in the company's elite tropical strains. The project will constitute the basis of a program for the production of maize hybrids. The commercialization of strains will help national companies to compete in the oligopolized market, increasing the sector's competitiveness.

278 Antibacterial Counter Flow Air Purifier and Humidifier for Domestic, Pneumological Clinics and other purposes

Coordinator:
Antonio Carlos de Barros Neiva

Company:
Aquar Desenvolvimento Tecnológico e Comercialização de Climatizadores Ltda.

Approved value:
Phase 1: R$ 24,200
Phase 2: R$ 207,595

The equipment proposed in this project functions as an antibacterial air purifier, humidifier and cooler. It forces the passage of air through an aleatory spray of droplets torn from a curtain of water. Its innovation consists in the geometry of the flows, with a horizontal curtain of water perpendicular to the ascending air discharge which creates an area of high turbulence close to the wall. The smaller droplets continue to ascend and evaporate, while the larger ones collect and drop down to the lower part of the equipment, performing the washing and retention of particles. The results of the humidification, of the adiabatic cooling and the elimination of living organic material in the four prototypes tested in phase 1 of the project were clearly superior to those obtained from an imported air conditioner, recently launched on the market. With the technical viability of the concept confirmed, it is believed that with development in phase 2, the product performance should be even better. Market research confirms promising expectations for climatizers, as the appliances that carry out adiabatic cooling and humidifying are generically being called. Applications range from air conditioners for residential use, in clinics, industry, in shops and in churches, among many others.

279 Optimization of the Process of Organic Film Formation by Cataforetic Deposition, Aiming for Energy Savings, Environmental Protection and Adaptation of the Process to National Climatic Conditions

Coordinator:
Célia Marina de Alvarenga Freire

Company:
Eccos Indústria Metalúrgica Ltda.

Approved value:
Phase 1: R$ 73,000

Still a recent technology, painting by cathode process can still be improved. The development of this area is heading towards producing films aiming for products with reduced or non-existent lead levels, with lower cure temperatures and lower levels of pigmentation in the film applied. The process of painting by cathodic electro-deposition is mostly used in trucks and vans, as with automobile chassises, since it can be applied on a variety of substrates such as: cold-laminated steel, aluminum, galvanized iron and iron pre-coated with zinc alloys. The advantages of this process are greater anticorrosive power and less environmental pollution, among others. The objective of this project is to implement the cataforetic painting process in an interested company, seeking to

evaluate the existing commercial systems. It is intended to analyze the principal parameters of the process (deposition time, voltage and mode of voltage application and temperature), to obtain better performance in relation to energy savings, environmental protection and resistance to corrosion. In the second phase, the focus will be on the influence of the surface preparation to find alternatives principally for the zinc and the zinc alloys, with a view to replacing the chromatization processes with adherence layers for the electrodeposited paints.

280 Restoration of Value to Polyethylene/ Aluminum Waste From Cardboard Packaging of Long Life type, Post-consumption

Coordinator:
Eliezer Gibertoni

Company:
COPOL - Compostos Poliméricos Eliezer Gibertoni

Approved value:
Phase 1: R$ 57,300

The objective of this project is to develop a continuous process for the recovery of waste polyethylene and aluminum derived from the recycling of cardboard packaging of the long life type, which consists of layers of paper, polyethylene and aluminum. The recovery of post-consumption cardboard packaging entails basically two different stages: the removal and recovery of the paper in paper industries and the regeneration and reuse of the polyethylene and aluminum in processes of plastics transformation. This innovation is based on the development of a disintegrator appliance, capable of removing the residual cellulose fibers present in the plastic shreds. The contamination of the cellulose fibers interferes with the thermic stability of the polymer, preventing the use of the shreds in conventional recycling processes. The innovation proposed in the building of the disintegrator involves the design of specific rotor systems to eliminate the residual cellulose fiber, together with systems of feeding and transporting the waste in an automatic and continuous manner, making it possible to obtain an increase in processing capacity with guaranteed product quality. The experiments carried out show that the material recycled in this way can be applied as raw material in the manufacture of many products in the plastics transformation industry.

281 Development of the First Brazilian Analyzer for Combustion Gases and Environmental Emissions

Coordinator:
Ênio Carneiro de Medeiros

Company:
Instrumeison Comércio de Importação e Exportação Ltda.

Approved value:
Phase 1: R$ 74,593

The objective of this project is to develop the first Brazilian combustion gas analyzer to determine concentrations of contaminants in the air. This equipment will make it possible to adjust to the maximum efficiency of industrial combustion processes (boilers, heaters and heat generation processes) thus reducing the costs of electricity and fuels by means of adjustment in the burning systems. In addition, the analyzer will be useful in the control of gas emission pollutants, reducing environmental effects which are harmful to human beings and the environment, such as the formation of polluting smog, acid rain and the occurrence of allergic diseases. The following steps are envisaged in the development of the project: 1) Development of two different types of electrochemical cells for the measurement of gases (O_2 and CO); 2) Development of a gas probe, for sampling, with integrated temperature measurement; 3) Development of a micro-controlled circuit board for the digitalization of data, processing of signal and calculation of the efficiency of combustion; and 4) Development of the plastic casing and plastic accessory for conducting the gas into the electrochemical cells. For the second phase, the intention is to make the product available to potential business customers.

282 Use of Titanium Powders Obtained by the HDH Route

Coordinator:
Francisco Ambrózio Filho

Company:
Brats Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 72,880
Phase 2: R$ 298,000

It has been established that, in the production of titanium powder by the hydration/dehydration route (HDH), there occurs a generation of a significant quantity of fine powders that cannot be used for the manufacture of filters. This project seeks to identify at least two commercial products for the remaining fractions of titanium powder. The proposed approach is the use of the fine fraction of titanium powder for the development of a production route for titanium parts and direct use of the powder for spraying dental implants. The main result of the first phase of the project was the qualification by companies Prodoctor-Implac and De Bortolli, of pilot batches of titanium powder for spraying. Among the activities planned for phase 2 are: the dissemination of the application of titanium powders produced by the HDH route for spraying bone-integrating dental implants; the production of pilot batches for parts; and making viable the use of titanium powders produced by the HDH route for surface treatments (thermic aspersion), among many others. If the proposed lines are established, there will be an increase in foreign exchange earnings, by the simple fact of replacing an import with a material of increased value (titanium powder) or a part manufactured from a sub-product (scrap or titanium residue) at lower cost.

283 Management of Companies Based on Projects via Workflow

Coordinator:
Gustavo Holloway de Souza

Company:
Alexander Lucinski & Consultores Associados em Informática

Approved value:
Phase 1: R$ 59,500

This project has four principal objectives. The first is to develop a management workflow which directs the activities of the projects manager and takes into account the evolution of the company as this process matures. The second is the self-training of these managers to create a common culture and enable professionals of little experience to apply best practice in the management of projects. This objective will be reached with the use of methodologies and e-learning integrated into workflow processes. The third objective is to introduce in the project the development of various automated communication functions, making it possible to increase the manager's efficiency and reduce errors in the project. And the fourth objective is to develop the audit of the company's management process, allowing its maturity to be measured, as well as providing necessary information for the planning actions for the continuous improvement of the management process and increase in productivity. The viability study of this project will include the topics of market research, definition of the technical architecture of the product and development of the costs estimate and field research to determine the potential market segment for the product.

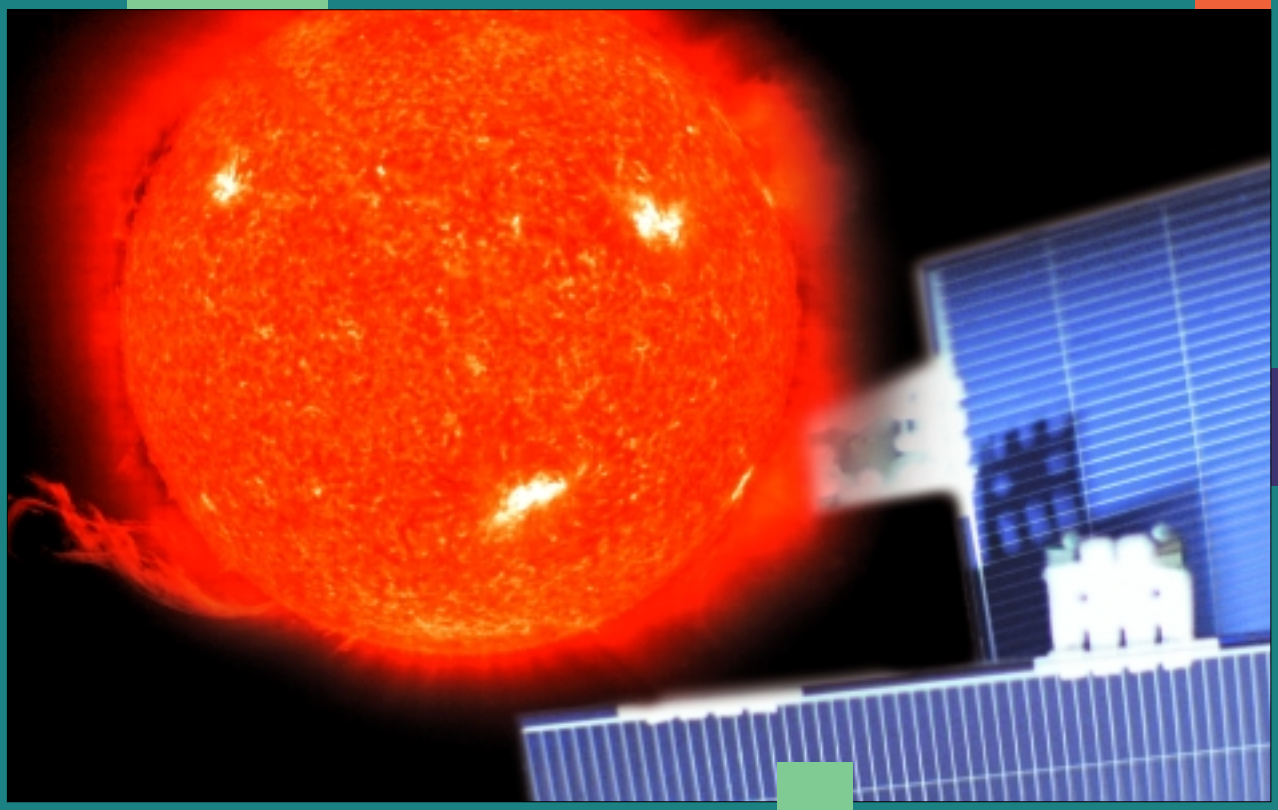
284 Research and Development of a Process for the Synthesis of Polypropylene with High Melt Resistance (HMS-PP) in Presence of Multifunctional Liquid Polymers

Coordinator:
Harumi Otaguro

Company:
EMBRARAD - Company Brasileira de Radiações Ltda.

Approved value:
Phase 2: R$ 181,277

Isotatic polypropylene (iPP) is one of the materials with outstanding use in the polymer commodities market owing to its special characteristics such as low density (a factor which accounts for its better cost/benefit relationship) and, principally, low cost of production. Nevertheless, iPP displays a low melt strength, which prevents it being used in various applications in which elongational flow is dominant. For example, applications of coverings extrusions, of thermoforming free of residual tensions, of blowing of larger parts, as well as the production of low density foams. With the aim of structurally modifying iPP so it will display a high melt resistance, this project proposes as methodology to irradiate, essentially with gamma radiation, pure iPP with additive in the presence of multifunctional liquid polymers of the acrylate and methacrylate families. These monomers will be responsible for the control of the ramification or reticulation in the polymer. The choice of these monomers is due to their solubility, high rate of reaction and availability on the market; the range of irradiation dose used will be around 10 to 20 kGy (kilogray). The choice is due to the fact that these values will have competitive prices on the Brazilian market and also because of the excellent results obtained with the production of HMS-PP (high melt strength



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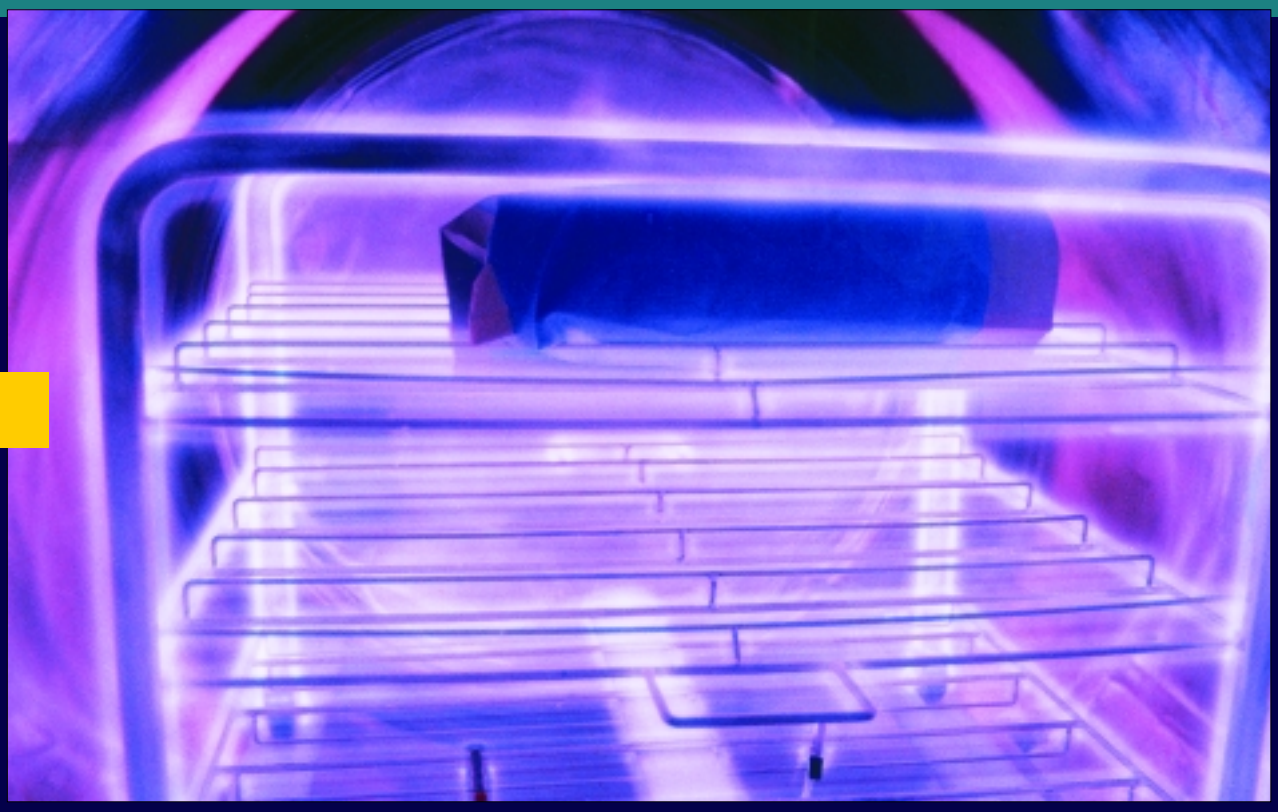

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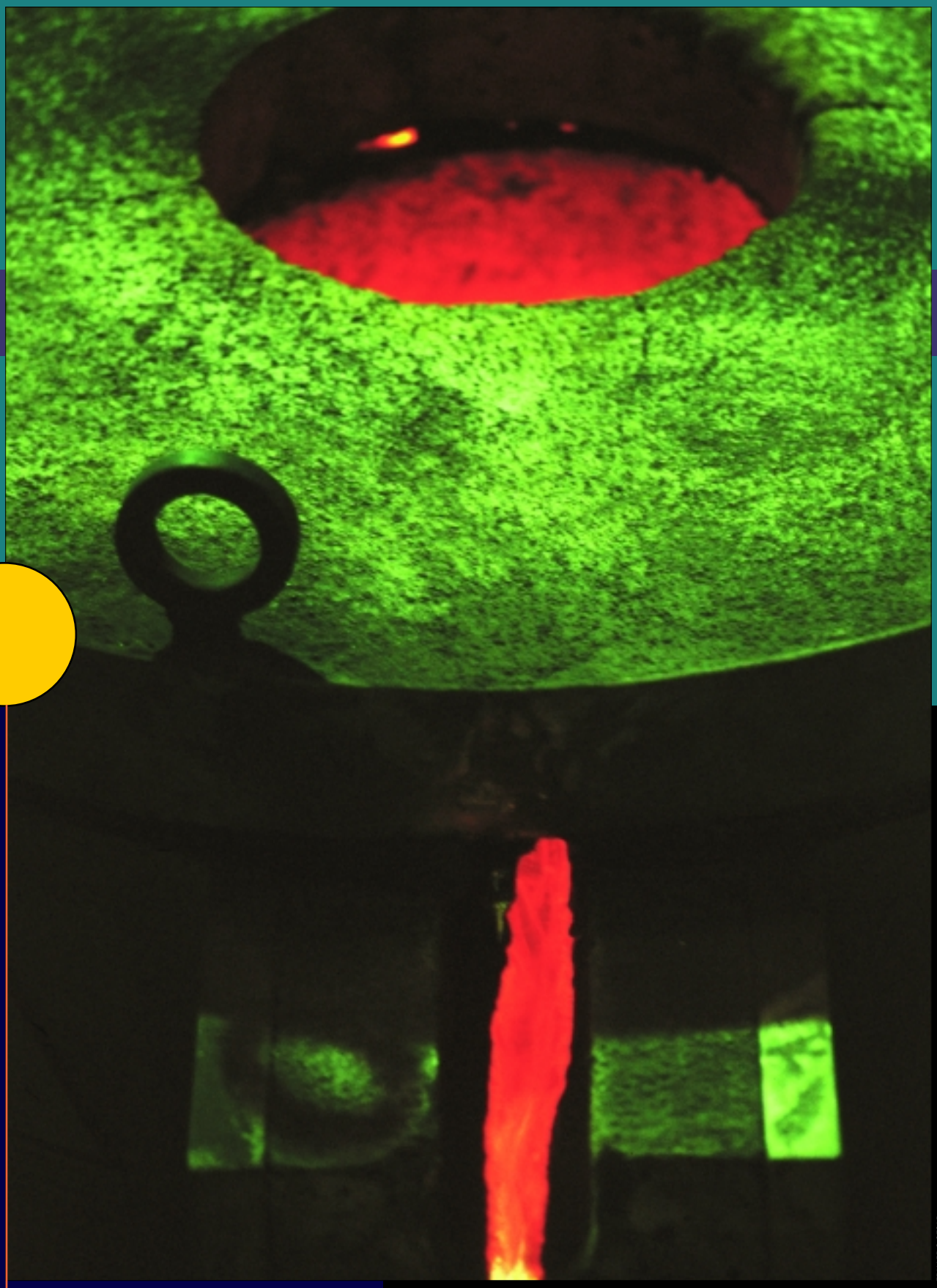

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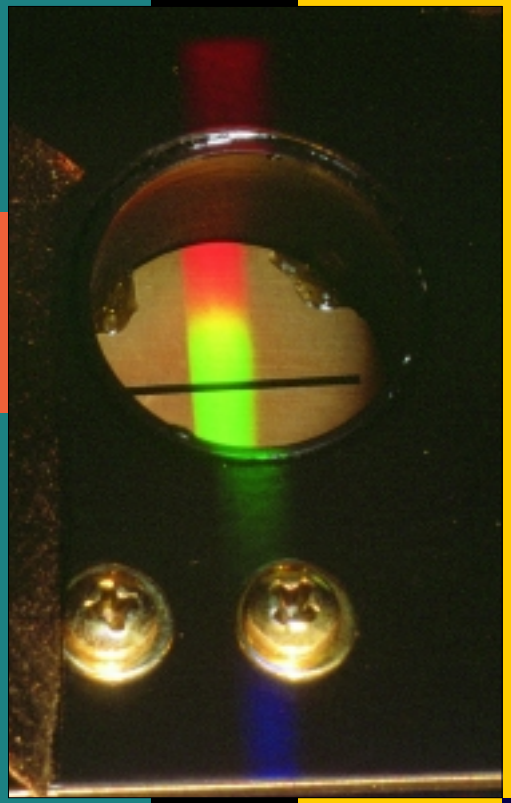

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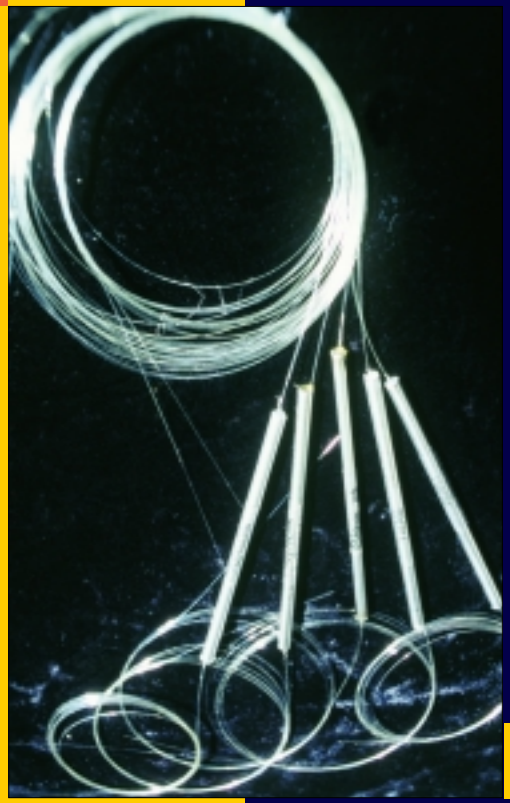

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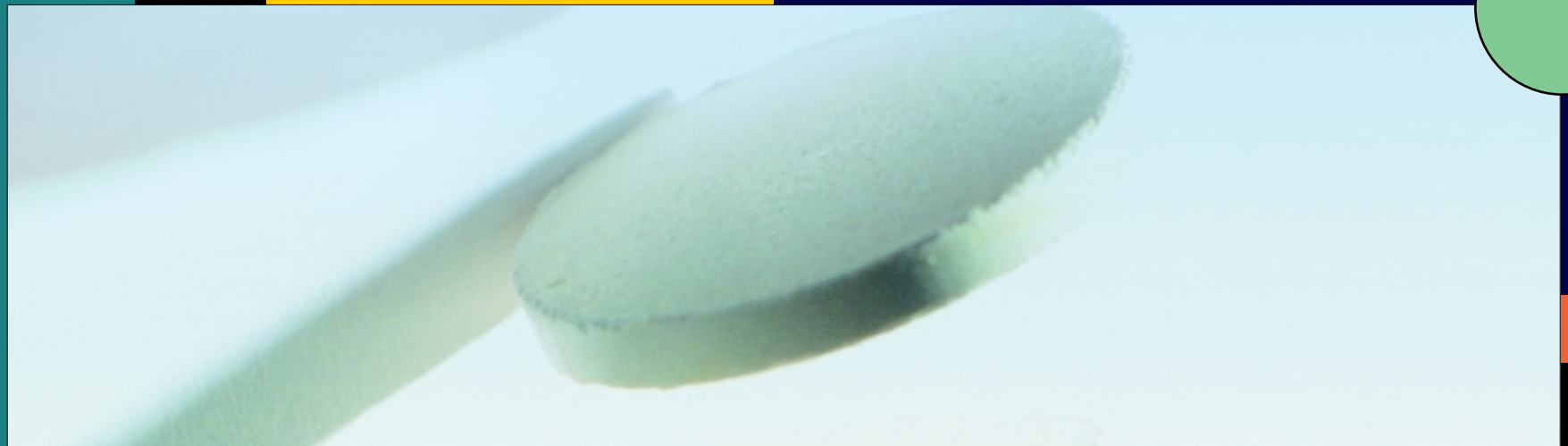

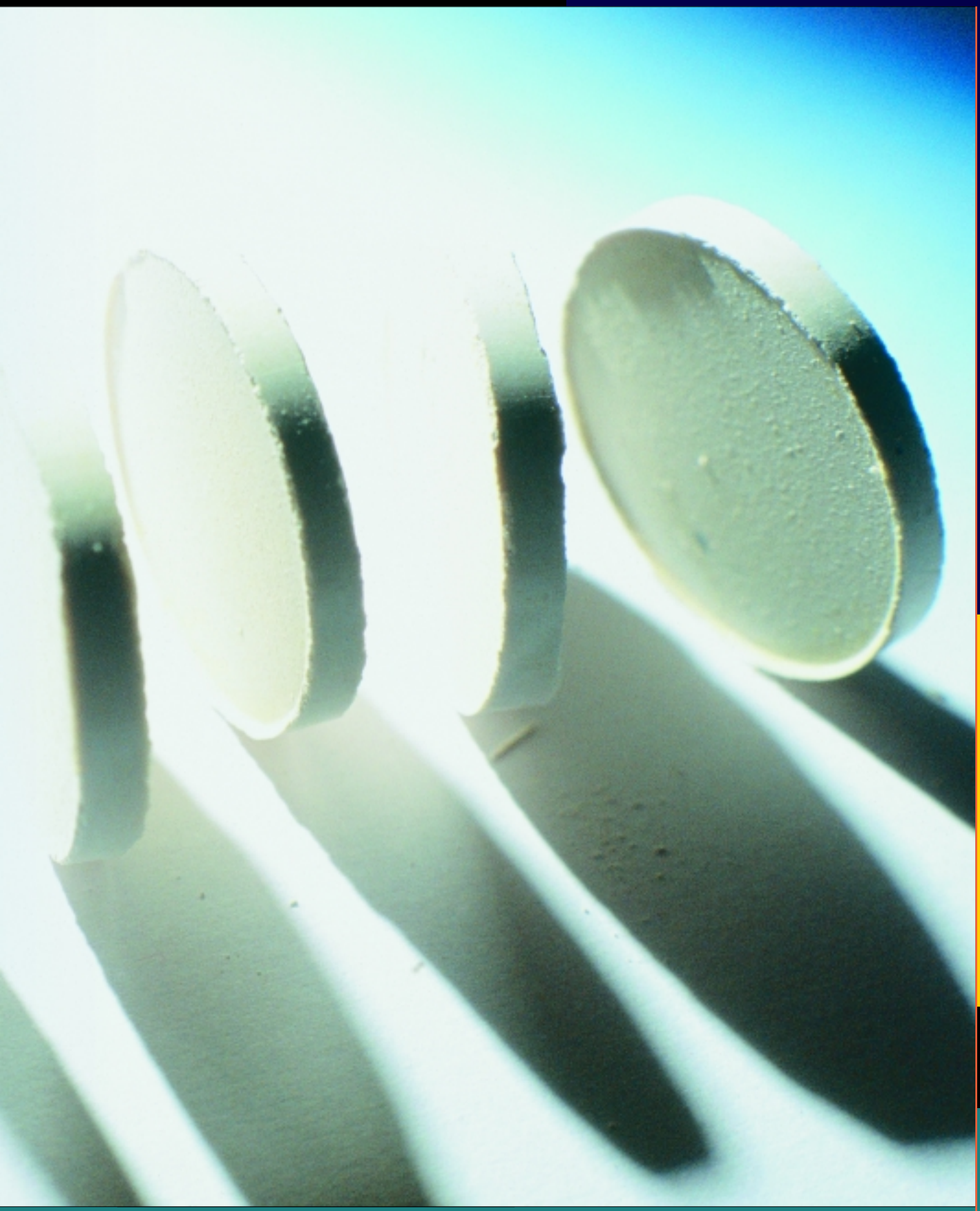

MIGUEL BOYAYAN

polypropylene) – an easier plastic product to produce and recycle – using acetylene gas as the multifunctional agent. With this development, it is hoped to obtain a methodology or alternative process for the production of HMS-PP which will make it more viable from the economic point of view and safer from the occupational and environmental point of view.

285 Development of Inorganic Low Toxicity Biocides

Coordinator:
Henrique Akira Ishii

Company:
IPEL Itibanyl Produtos Especiais Ltda.

Approved value:
Phase 1: R$ 74,246.33

This project proposes the development of an inorganic antimicrobial biocide, salts based on silver with additions of zinc and/or copper nitrates, with a ceramic substrate (tricalcic phosphate, titanium dioxide and calcium silicate); its use covers the areas of treatment of drinking water, surgical-hospital materials (for example, catheters, dialysis tubes, floor and fabrics), cosmetics, paints and coverings, polymers and ceramics. Among the most attractive advantages of the use of inorganic biocides as concerns biological and environmental demands and antimicrobial activity, are the following: 1) low or non-existent toxicity for human beings, hence, its use for application in cosmetics and the treatment of drinking water; 2) absence of risk to the environment; 3) it is not leached (eliminated by being washed away or by rain, for example), which makes it ideal for application in fabrics, ceramics and paints; 4) long useful life. Inorganic antimicrobials offer advantages in these areas when compared to traditional biocides (based on organic compounds) at a significantly lower cost. In addition, this project should result in a technological gain for the country since it involves the development of a product without national equal.

286 Electromechanical Packaging of Environmentally Isolated Piezoresistant Pressure Sensors Used in Industrial Pressure Transducer and Transmitters

Coordinator:
Humber Furlan

Company:
Orion Ind. e Com. de Sistemas Automatos de Pressão Ltda.

Approved value:
Phase 1: R$ 39,130 / US$ 8,748

The project's objective is to make viable the building of a prototype environmentally isolated pressure sensor, using a low cost high quality stainless steel structure for use in the measurement of pressures in gases, liquids and in media compatible with steel AISI 316. This entails a device with excellent stability and adequate longevity for industrial applications, in automotive diagnostic systems, in hydraulics and other market segments which require high precision and high performance. This type of apparatus incorporates the state of the art technology in environmentally isolated pressure sensors and can be used for pressure transducers and transmitters. The prototype pressure sensor will contain: silica piezoresistant microsensor; electrical terminals for contact; stainless steel casing; stainless steel membrane; ring to secure membrane; vitreous resin for insulation of electrical terminals; and a piece made from ceramic for the electrical and thermal protection of the sensor. The piezoresistant microsensors will be imported and lodged in a mechanical cavity made of stainless steel AISI-316, sealed by means of a corrugated membrane made from the same steel, the chamber of which will be filled with a siliconated liquid, inert to the sensor, which will transmit the pressure between the corrugated membrane and the piezoresistant sensor. Thus, the microsensor will be conditioned by a medium inert to bad weathers and aggressions that possible applications may present.

287 System for Generating Numerical Terrain Models Based on Polarimetric Images from Band P Radar

Coordinator;
José Claudio Mura

Company:
Orbisat da Amazônia Ltda.

Approved value:
Phase 1: R$ 54,000

This project aims to enable the company to generate Numerical Terrain Models (NTM) by means of the use of polarimetric images from airborne Synthetic Aperture Radar (SAR), in the microwave fre-

quency band named P band for environmental and cartographical applications, among others. The methodology for the generation of NTMs is based on the use of interferometry of radar images, which uses the processes of image recording, calculation of phase difference (interferogram) between images, phase separation and calibration, geocodification and generation of the NTM. P band was chosen because of the greater penetration of its microwave signal in areas with a dense forest covering. The penetration of this signal is related to the forest structure and the polarization used. In the first phase of the project polarization III will be used. The NTMs generated by the proposed approach should represent the elevation of the terrain with low interference from the vegetation, according to the polarization used. The system should be validated in areas of primary and secondary forestry physiognomy (height of vegetation and biomass), in areas of homogeneous planted forest (*eucaliptus* and *pinus*), and also in reservoir areas with occurrence of aquatic plants (macrophytes).

288 Microencapsulation of Pigments for Application in Special Paints

Coordinator:
José Leoni Tremeschin

Company:
Carol Química Ltda.

Approved value:
Phase 1: R$ 14,500

The technique to be developed in this project should minimize or even eliminate some of the existing problems in pigments used in paints. There will be a chemical protection of the pigment with the coating of its particles, providing greater resistance to aggressive agents, such as ultraviolet rays, acidity and alkalinity existing in the localities where the paint is applied. It is also hoped that, with the encapsulation of the pigment, it will present a minimum of aggregate and agglomerates, which permit economy and greater speed in the paint-making process. The encapsulation could result in decreased absorption of the pigments and represent a possible solution to the problem of stocking some paints which, with the passage of time, lose their drying power. This is because the pigments begin a process of absorbing the drying agents which disables, by means of chemical reactions with the vehicle, its characteristic of promoting the drying of the paint with a consequent loss of the product's shine and finish.

289 Training System in the Area of Security

Coordinator:
José Roberto Boffino de Almeida Monteiro

Company:
Cientistas Associados, Comércio, Representação, Consultoria e Treinamento Ltda.

Approved value:
Phase 1: R$ 75,545

The training systems used today by security businesses and by the civil and military police (state and federal) do not permit much interactivity as they do not convey the sensation of reality with which the professional is going to be confronted. This project aims to remedy this deficiency with the development of a computational system which permits the user to interact with a reality much closer to daily life. This system needs to employ advanced techniques in the area of interactive interfaces, processing and analysis of images and computational intelligence. The starting point is the showing of a film, as a foretaste, which depicts events such as assaults, kidnappings, and bank robberies, among others, with real-size human beings. This will produce, both through the images and the sounds, a sense of physical presence in the training environment. Carrying a real weapon with silicon bullets, the user will have to take decisions, as for example the exact moment at which to draw the weapon and shoot and the point which the shot should hit. Subsequently, the film will be re-run taking account of the user's decision. In addition, in a second stage, the system is intended to interact by shooting at the user, better preparing him to face risks.

290 Development of Equipment and Method for the Dehydration of Fruit and Vegetables

Coordinator:
Julio Suzuki

Company:
Fumito Comércio e Indústria Ltda.

Approved value:
Phase 1: R$ 69,180
Phase 2: R$ 291,000

Fruticulture has enormous potential in the Brazilian agribusiness, but its expansion still needs to

overcome hurdles such as the deficiency in post-harvest handling, principally to prevent the rotting which occurs during storage and transport. The main objective of this project is the development of a machine for the dehydration of fruit and vegetables aimed at carrying out the monitoring of the principal variables in the process. The prototype will be used to define the cycles of dehydration and the characterization of each type of fruit and vegetable, which will lead to the building of dehydration equipment specific to the different products. There is no known dehydrator manufacturer in Brazil producing equipment which provides the technology capable of processing different types of fruit and vegetables, offering a range of applications for a few kilos (domestic machine), up to a hundred kilos (industrial equipment). The basic working principle of the proposed dehydrator is the withdrawal of water by means of a drying action in which relative temperature and humidity are controlled so as to prevent the deterioration process and minimize damage to the cell structure, preserving the integrity of the product. In the second stage of the project the intention is to develop techniques and equipment for the dehydration of vegetables.

291 Cellular Module 2.5/3G for Machines

Coordinator:
Lauro Rubens Lyra Girardelli

Company:
KBS Empreendimentos e Participações S/C Ltda.

Approved value:
Phase 1: R$ 69,100

At the present time the route is being defined for the third generation of mobile phone (3G), which will enable access to data at high velocity and will trigger the commercial explosion of cell phone telemetry applications. Some functionalities of the 3G cell phone are commercially available in the transitional technologies called 2.5G. The present project aims to prove the technical viability of the development of a modular 2.5/3G cell phone for communication with machines based on commercial chipsets. In the first stage, the objective is the definition of the 2.5/3G chipset. The analysis is composed of: initial specifications of the requirements, research on chipsets currently available, comparison (functionalities, cost, reliability), choice of chipset to be used and assembly of a prototype covering basic communications functionalities. The objective of phase 2 will be the development of a 2.5/3G module for cellular communication with machines based on the chipset chosen in phase 1. The commercial applications of this product could include, among others: automatic meter reading, such as water and electricity; vehicle control (tracking and blocking); automation (in remote industries or production units); and electronic security in properties and ATM machines.

292 Development of Optimization Solvers for Commercial Applications

Coordinator:
Miguel Taube Netto

Company:
Unisoma Matemática para Produtividade S/A.

Approved value:
Phase 1: R$ 75,000
Phase 2: R$ 200,000 / US$ 44,200

This project puts forward the proposal to validate and refine optimization solvers developed and made available by national research institutions. In this way, it is hoped that not only will UniSoma be able to end its present technological dependence on its international software suppliers, but also enable the development of a policy to make better use of nationally developed technology. The project aims to refine the Abate system, installed by UniSoma in the Perdigão company, to optimize the planning of chicken slaughter batches, bearing in mind wider ranging applications, involving turkeys and pigs. This system should also be commercialized abroad. Another goal of the project is to refine solutions already installed by UniSoma in the area of forestry planning, used in Cenibra, Veracel and Aracruz, considering heuristic methods in replacement for the CPLEX solver. Also envisaged is the development of a routing algorithm based on distribution centers and deliveries with time window, taking as reference the project under way with Casas Pernambucanas. The company also aims, among other additional objectives, to broaden the non-linear programming procedures available in Aimms (Advanced Integrated Multidimensional Modeling Software) for applications in blending (mixtures) auto-oven load (Companhia Siderúrgica de Tubarão) and petrol refining (Refinaria de Manguinhos).

293 Production of Linalool based on Essential Oil of Basil - a Sustainable Ecological Alternative to Replace Linalool from the Bendy Tree, an Amazonian Threatened Species

Coordinator:
Nilson Borlina Maia

Company:
Linax Comércio de Óleos Essenciais Ltda.

Approved value:
Phase 2: R$ 300,000

This project aims to transform into production the results of research developed in the Institute of Agronomy, which showed the potential for the economic exploitation of linalool derived from the essential oil of basil. The development of this new system of production is doubly advantageous. First, because it may free from extinction the bendy tree (*physocolymma scaberrimum*), from which linalool has been traditionally extracted. In second place, as it offers a real opportunity for family farmers in the region of Votuporanga (SP) to make a living, creating a new segment in agribusiness: the exploitation of essential oils. Whereas the tree must wait more than three decades before its trunk can be cut down and the oil contained in it extracted, which signifies the elimination of the plant, the leaves from the herb can be distilled to produce the essential oil three or four months after planting, with the possibility of three crops per year. The research project concluded in the first stage clearly showed the viability of the economic exploitation of linalool derived from basil, given sufficient subsidies to set up the industrialization of the product.

294 Development of Technology of Production and Improvement to Mechanical Properties of High Silicate Cast Iron

Coordinator:
Omar Maluf

Company:
Fultec Inox Ltda.

Approved value:
Phase 1: R$ 45,656
Phase 2: R$ 91,304.40

High silicate cast irons are basically ternary alloys Fe-C-Si (iron-carbon-silica), recommended for applications which demand high resistance to corrosion, a characteristic obtained by the formation of a protective film of hydrated silica oxide on the surface of the component. This resistance improves when the silica content is increased. However, the mechanical properties are proportionally impaired by this increase. The low mechanical resistance of this material, when compared for example, with common cast iron, is responsible for its limited use. To carry out the first phase of this project an alloy based on the cast iron in question was selected, from which three different metal alloys were produced – by the addition of new alloying elements in different percentages –, with which the experiments will be carried out. The base alloy will be composed of Carbon, Silica, Manganese, Phosphorus and Sulfur. In phase 1 of the project, two alloys of different chemical compositions offered the best results for mechanical resistance and toughness. These alloys will be characterized by means of corrosion and wear tests at environmental temperature; bending, traction and conventional impact tests at high temperature; and instrumented impact tests at environmental and high temperature.

295 Production of MnZn Ferrites with High Permeability and Low Magnetic Loss by Co-precipitation Method

Coordinator:
Suzilene Real Janasi

Company:
Imag Indústria e Comércio de Componentes Eletrônicos Ltda.

Approved value:
Phase 1: R$ 43,560
Phase 2: R$ 258,250 / US$ 10,595

MnZn Ferrites (ceramic insulators with low density of zinc manganese) are commercially obtained by the ceramic process which involves solid state reactions between oxide precursors or carbonates at high temperatures (above 1100 degrees Celsius). The resultant particles from this process are relatively large and not of uniform size, and the products obtained do not offer good reproducibility. Faced with these difficulties, the co-precipitation method looks like an interesting alternative. Using this method it is possible to achieve a more chemically homogeneous powder, with finer, more uniform particles and good reproducibility. This project proposes the production

of MnZn ferrites by the co-precipitation method, with the principal objective of obtaining a material with high permeability and low magnetic loss for use in impedance nuclei, a product for which demand has been growing in the national market. The research will especially focus on the synthesis of the precursor powder and on processing. To make the production of these ferrites viable and to guarantee that the final product offers better properties than that produced by the ceramic method, all the conditions of synthesis are being defined on laboratory scale. Equal care will be taken in the processing of the synthesized powder, principally where it concerns the sinterization cycle, an elaborate and important stage in the processing of MnZn ferrites, when properties of high permeability and low losses are desired.

296 Optimizer for Insertion of Adverts in Printed Media Using Mean-Variance Model

Coordinator:
Pedro Jesus Fernandez

Company:
Ipsos Novaction Brasil Ltda.

Approved value:
Phase 1: R$ 73,680
Phase 2: R$ 217,000

The objective of this project is the development of an optimization system for printed media based on the model of generalized mean-variance (known also as the generalized Markowitz Model), a celebrated paradigm in the financial market, but as yet not exploited in the media market. A mean-variance model manifest itself in the form of a problem of quadratic programming in which the function-objective represents a compromise between the expected return (profitability) and variance of return (risk). In this approach the diversification of steps occurs naturally, without the need for artificial restrictions. Linear restrictions, such as disposable budget, can also be inserted in the model. In phase 1 of this project, the proposed methodology was implemented in a prototype validated by means of real data on the sales of magazines. Two fundamental characteristics of the model were verified. In the first place, it allows linear restrictions to be imposed and dealt with, which lends the model great flexibility. In the second place, it demonstrates its ability to speed up the process of creating efficient media plans. The central aim of phase 2 will be to develop an integrated and user-friendly system for the optimization of insertions in the printed media based on the mean-variance model.

15th BIDDING INSTRUCTIONS

297 Optical Reflectometer (Not in Time-Domain)

Coordinator:
Benjamin Grossman

Company:
Cromática Sistemas de Comunicação de Dados e Informática Ltda.

Approved value:
Phase 1: R$ 25,000 / US$ 6,500

Optical fiber joints display discontinuities in connections involving optical connectors. The connection quality in monomode fibers is characterized by various losses of a physical order, such as insertion loss, return loss (or reflection loss), of a geometric order such as dislocation of the apex, measurement of protrusion or inversely, measurement of fiber recession in relation to the end of the connector, and alteration of polarization in polarization-retaining fibers, among others. This project proposes the construction of a reflection-loss meter, known as an optical reflectometer (not in time-domain) to be used to measure the optical power that returns through the fiber in the mentioned discontinuity. In high velocity optical joints and also in those that use multiplex or wave complement, the return loss is a fundamental variable to be measured. At present, telecommunications operators routinely insist that this variable be measured within a certain range for each connector to be accepted and included in the network, besides of course, the other variables mentioned which must also fit within acceptable ranges.

298 Development and Optimization of a Process for the Electrosynthesis of Hydrogen Peroxide

Coordinator:
Carla Badellino

Company:
Água Limpa - Bertazzoli Ltda.

Approved value:
Phase 1: R$ 44,866
Phase 2: R$ 162,119

Hydrogen peroxide, an oxidizing agent used in organic syntheses, discoloration processes and bleaching and in the treatment of effluents, can be generated by the reduction of oxygen in watery solutions. In this project, the objective is to develop and make commercial and process an item of equipment for the electrosynthesis of hydrogen peroxide for use in the oxidization of organic compounds and in the treatment of industrial effluents. In phase 1 of the project a study was carried out into the viability of the proposal by means of benchtop trials. Phase 2 will involve the assembly of a prototype of electrochemical reactor. The intention is to structure the design, the manufacture, assembly, installation and begin to operate the equipment for the production of hydrogen peroxide. Subsequently, studies will be carried out to optimize the functionality with regard to the speed of electrogeneration and the electric efficiency. Intensive operation will also serve to establish operating routines, the useful life of the components, the periodicity of preventative maintenance and the operation and maintenance costs. The intensive operation tests will include the electrogeneration of the oxidizing compound in the *in situ* treatment of simulated watery effluents. For these tests effluents containing the reactive colorant Remazol Black and also the acidic herbicide, 2,4-Dichlorophenoxyacetic acid (2,4-D) will be used.

299 Evaluation of Methodology and Techniques for the Industrial Production of Entomopathogenic nematodes and Study of Market for Commercialization of these Agents

Coordinator:
Carmen Maria Ambros Ginarte

Company:
Bio Controle - Métodos de Controle de Pragas Ltda.

Approved value:
Phase 1: R$ 55,201
Phase 2: R$ 282,617

Despite the large existing market, there is still no company in Latin America producing entomopathogenic nematodes. In view of the results obtained in the project "Entomopathogenic nematodes: mass production and potential for use in the control of pests", financed by FAPESP and coordinated by the Biological Institute, the intention is to commence industrial production of these organisms (*Heterorhabditis sp.* and *Steinemema sp.*), with a view to commercializing them for use in the control of various insects and pests. The objectives of the present project are: 1) to compare the yield of *Heterorhabditis sp.* and *Steinemema sp.* produced by the sponge and fermentation processes; 2) to develop and evaluate formulations of entomopathogenic nematodes; 3) to produce the nematodes on a semi-industrial scale; 4) to confirm the efficiency of the nematodes produced *in vitro* against some insect pests; and 5) study the market for the use of entomopathogenic nematodes. In the studies undertaken in the first phase of this project, the real and the potential markets for the use of these nematodes were evaluated as well as the difficulties and the requirements to establish in the second phase, a biofactory for these agents, with a large part of the problems associated with mass production now solved. The establishment of a biofactory for entomopathogenic nematodes will be of great importance for the advance in the handling of pests in Brazil, with the reduction in the use of chemical insecticides and all the other resultant advantages.

300 Development of a Controller for Application of Liquid Fertilizers

Coordinator:
Claudio Kiyoshi Umezu

Company:
Tandra Sistemas de Controle Ltda.

Approved value:
Phase 1: R$ 45,060

The application of agricultural fertilizers has traditionally used fertilizers of the solid, pre-formulated types. However, higher levels of productivity have been obtained with the adoption of liquid fertilizer, which offers a further advantage: the possibility of greater control over the quantity and the area where it is used, decreasing losses and contamination of the environment. The equipment for the application of liquid supplies existing on the market, controlled by electronic devices, can operate constant or variable application rates, however they are not able to formulate the supply according to the lo-

calized need of the soil nutrients. The principal objectives of this project are: 1) to study the technical viability of an autonomous control system for the local application of liquid fertilizer at variable rates, with the capacity to vary the formulation in real time, which may be used in commercial implements already existing; and 2) to carry out the preliminary analysis of the cost of the control system and its commercial return. The evaluation of the control system will be undertaken in the laboratory, using application maps specially created with a view to exploring different work situations as far as formulation and dosage are concerned. In this stage a cost analysis will also be undertaken and the identification of suppliers.

301 Development of Modular Software for the Analysis of Genic Expression

Coordinator:
Daniel de Oliveira Dantas

Company:
Sunset Informática Ltda.

Approved value:
Phase 1: R$ 55,900

This project aims to develop a piece of modular software for the analysis of genic expression, measured by microarrays, membrane arrays, sage or other techniques. The software should be composed of the following modules: image analysis; database; normalization; clustering, and reduction of dimensionality. The image analysis module permits the measurement of expression based on microarray images or membrane array. The database module stores the architecture of the analyzed chip, the genes associated with each spot and permits the organization and retrieval of information from several related experiments. As the name itself indicates, the normalization module attributes measurements for various experiments with the same reference, making it possible in this way to compare results. The clustering module makes possible the grouping of similar signals, obtained in experiments of temporal expression measurement or progressive, increasing or decreasing stress. The reduction of dimensionality permits the discovery of a minimum gene set, the signal of which makes it possible to differentiate at least two biological states of interest. This software offers some innovative characteristics compared to other known programs, among which: the method of image analysis is based on a technique of precise segmentation of the spots; the databases can store families of experiments and not just one experiment, as is the norm; the procedures of reduction of dimensionality applied are innovate techniques developed by the group itself.

302 Modeling and Development of a System for Integrated and Efficient Management of Electricity Sector

Coordinator:
Elias Roma Neto

Company:
Mind Games Software S/C Ltda.

Approved value:
Phase 1: R$ 19,982

The present electrical energy crisis is leading governments, businesses in the electricity sector and large consumers to look for new ways of generating, transmitting and distributing energy and solutions for increasing efficiency and installed capacity. Brazil has gone on to discuss in greater depth the quality of the energy generated, transmitted, distributed and consumed in a scenario of a restructured electrical sector. The basic objective of this study is to test the technical viability of the development of a computational tool the conception of which is geared towards helping the management of the electricity sector in an integrated and efficient manner. Its specific objectives are compliance with legal obligations on the part of the agents, including the regulatory bodies, preservation of natural resources afforded by the promotion of information, and simulations and improvement in the quality of services and management support based on the integration of diverse sources of information handled under the focus of process and information technology. It is hoped that the specification of this computational tool will assist in the simulation of desired results and the identification of the origin of distortions and waste, with a view to reducing costs and an improvement in the quality of the services delivered.

303 Production of Colored Gold Alloys by High Energy Milling

Coordinator:
Eneida da Graça Guilherme

Company:
Regulus Ars Tecnologia em Jóias Ltda.

Approved value:
Phase 1: R$ 70,600

The fascination which gold exerts through its brilliance, beauty and rarity is the great driving force in jewelry technology. In this context, color plays an important role, since it adds diversity and originality to the pieces, adding artistically to their value. Based on a technique used in powder metallurgy, known as high energy milling, this project aims to create, mechanically, colored (white, red, green, violet, blue and black gold alloys). The production of powdered colored gold is unprecedented in Brazil and in the world. The powders of the alloys obtained will be aimed at decorative coverings, especially in the case of jewels, giving them an innovative artistic cachet. The production of the alloy powders by milling (processing in solid state) will allow the chemical composition of the product to be controlled with great precision, which will afford a sensitive adjustment to the colors. The form of the powders will also be able to be controlled, which will have a direct bearing on the brilliance of the product. The technological innovation proposed here will be employed in Regulus Engenharia, counting on the partnership of a jewelry designer and with the support of laboratories of the Institute for Energy and Nuclear Research, Ipen.

304 Development of Atomic Absorption Spectrometer with Electrothermic Atomization Using Tungsten Filament Based in Pulsed Xenon Lamp and Linear Image Sensor

Coordinator:
Lídio Kazuo Takayama

Company:
Femto Indústria e Comércio de Instrumentos Ltda.

Approved value:
Phase 1: R$ 74,255
Phase 2: R$ 300,000

At the present time there is no manufacturer producing atomic absorption spectrometers in Brazil. The aim of this project is to develop and launch the first of these devices with totally Brazilian technology and software, in the hope also that it will have an impact on the international market. The basic proposal is to assemble an atomic absorption spectrometer with an electrothermic atomizer, using a complete tungsten filament, including: light source with a mechanically choppered hollow cathode lamp, high resolution monochromator with wavelength around 1,0 nanometer, detection system with lock-in amplifier and photomultiplier, analogue-digital converter, software for management of system and mathematical treatment of signal. To test the initial technical viability, the prototype will be simplified with a hollow cathode lamp. With good results obtained in the first phase of the project, in the second phase this prototype will be perfected, including automatic lamp change, automation of preparation and introduction of samples. Once the product is developed, the intention is to launch it initially on the Brazilian market, and subsequently offer it on the international market.

305 T-Learning – Learning Based on Interactive Digital TV

Coordinator:
Rodrigo Cascão Araújo

Company:
Amaury José Alves Aranha

Approved value:
Phase 1: R$ 26,360
Phase 2: R$ 232,460

This research aims to approach the state of the art in T-learning, with a view to developing collaborative training and learning programs, using the technology of digital television transmission. In phase 1 of the project, the studies carried out delved into themes linked to the technologies involved in the transmission and production of programs for digital TV. In parallel, a detailed analysis was undertaken of the way of adapting the teaching methods of existing training courses for online learning to a model based on transmission and interactivity via digital TV. In the first phase of the project some prototypes of educational programs were developed, aiming to refine the existing technologies. At the same time, public and private learning institutions were identified which had an interest in participating as partners in the development and as users of the programs to be

created. In phase 2 of the project, the intention is to draw up a business model involving the supply of software components, audiovisual products, interactive services and learning objects for digital TV. The development of this model should involve the research and generation of innovative technological products and the search for partners and customers to broaden the application of the results of the project.

306 Production of Stainless Steel Powder by Water Atomization

Coordinator:
Nelson Karsokas Filho

Company:
Brats Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 67,000

This proposal aims to develop and qualify a producer of austenitic stainless steel powder by water atomization, with a monthly supply capacity of 20 kilograms of powder within granulometric range of between 500 and 850 micrometers and with apparent density below 2 grams per cubic centimeter, specified for use, principally in the manufacture of porous components. The basic objective of the project are: 1) Identification of the effect of process variables (type of raw material, nozzle diameter, water pressure and flow temperature) in the characteristics of the powders obtained; 2) Production of pilot 20-kilos batches, per month; and 3) Manufacture and characterization of metallic filters produced from the pilot batches. For the first phase it is hoped to define the atomization process parameters that will permit the production of at least 20 kilograms with a granulometric range between 500 and 800 micrometers and an apparent density below 2 grams per cubic centimeter. As yield in this range is probably low – close to 25 per cent – a hoped for result is the viability of using the fine fraction, principally for the manufacture of sinterized structural components, either by conventional powder metallurgy, or by powder injection molding. The intention is also to build prototypes to be tested by end-users for performance evaluation, comparing them with parts obtained from imported raw material.

307 Software Dental Software for Color Mapping and Selection of Restorative Materials Aided by Computer - Phase 1: Determination of Colorimetric Variation Curve of Resin Compounds

Coordinator:
Osmir Batista de Oliveira Junior

Company:
Fornazari, Papini & Cia Ltda.

Approved value:
Phase 1: R$ 36,312

Errors in the empirical selection of colors of esthetic restoration materials are fairly common in dentistry and cause financial and psychological distress to patients, as well as giving rise to doubts concerning the competence of the dental surgeon. The objective of this software is to develop a piece of national software to map tooth color and indicate which restoration materials should be used for the esthetic solution of clinical cases. This software should have advantages such as low cost, guarantee of reliable results, greater productivity and lower level of stress, both for the patient and for the professional. For the preliminary testing of the viability of this proposal, part of the module recognizing the standards will be developed, with the aim of acquiring the specific knowledge for finalizing the software. The company will use the concepts of fuzzy logic, proposed by Zadeh (1960) to determine the variation in colorimetric curve of test samples of resins composed of different manufactures and colors. This sub-model will read pixel by pixel all the images from the test samples and will determine the interval limit (maximum and minimum) for each material tested and will characterize each resin in terms of the greater frequency of pigments present in each of the test samples. The images will be analyzed without conversion to determine the shade/color depth and in grayscale to determine the luminosity curve of each one.

308 Hotel Environmental Adaptation Project – Diagnosis, Adaptation and Environmental Innovation in Hotelier Sector

Coordinator:
Takako Matsumura Tundisi

Company:
Instituto Internacional de Ecologia São Carlos Ltda.

Approved value:
Phase 1: R$ 51,266
Phase 2: R$ 224,911

The central region of the state of São Paulo, comprising cities such as Águas de São Pedro, Barra Bonita, Bocaina, Brotas, Corumbataí, Descalvado, Dois Córregos, Dourado, Ibitinga, Pirassununga, Porto Ferreira, Ribeirão Bonito, São Carlos and São Pedro, among others, has proved to be one of the major poles of tourist visitation in the state. This project aims to develop and apply a methodology for diagnosing the environmental adequacy of the hotelier businesses located in those cities, with the creation of a digital database to process the information qualitatively and quantitatively. It is also intended to format digitalized maps of the region so that the businesses can visualize their location in the light of thematic maps of hydrography, road network and vegetation, aiming for greater use in terms of typology/locality of the exploited resources. A piece of software will also be developed, applicable to any other region in the country containing the methodology for self-diagnosis and road map for the implementation of necessary environmental adaptations which could be acquired by any interested public or private sector. Guidance will be available regarding any resultant regional adaptations, in terms of the dimensions of the task, the proximity and sustainable forms of exploitation of the natural resources, as well as the breadth of the adaptation, whether complete or in sectors.

309 Monitor: an Environmental, Socioeconomic, Operational and Production Monitoring System

Coordinator:
Tatiana Mahalem do Amaral

Company:
Athena Sistemas de Gestão em Recursos Naturais Ltda.

Approved value:
Phase 1: R$ 54,500
Phase 2: R$ 89,300 / US$ 1,787.50

The project will bring about the development of an environmental, socioeconomic, operational and production monitoring system (Monitor), aimed at forestry businesses, associations and public institutions linked to the sector. This entails a management tool which evaluates the forest conditions, the return on forestry products and management activities and their impact. The project also includes a manual, training and software installation services. The system should organize and store on a relational database all the monitoring information and make it available to the user for the tracking of performance indicators, by means of practical methods of calculation and data analysis. In addition to this, Monitor will provide with great facility the information required for certification processes, audits, licenses, evaluations of environmental impact and control, among others. The system should help companies justify investments in the adoption of alternative production practices and in the restoration of degraded resources. The development of the software will be based on the diagnoses which were carried out by two forestry companies, Precious Wood and Riocell (Aracruz). In this way, Monitor will address both Brazilian forestry realities, namely, natural forests and planted forests.

16th BIDDING INSTRUCTIONS

310 An Approach to Gradual Migration from Legacy Applications

Coordinator:
André Luis Costa de Oliveira

Company:
Apyon Technology S/A

Approved value:
Phase 1: R$ 61,650

An Approach to Gradual Migration from a Legacy Applications Software System is an evolutive artifact. With the passage of time, its original design and implementation are modified to meet new requirements and/or to improve its performance, incorporating substantial new knowledge into its context. This process is called constant maintenance. But after four years, approximately, applications become legacy, since the technology on which they were based are out-of-date and in the majority of cases no longer supported by the manufacturers. Legacy applications contain program logics, project decisions, users's requirements and business rules that need to be recovered, interpreted and converted,

which corresponds to approximately 25 per cent of the application's complexity. The remaining 75 per cent is related to technological aspects, such as transactions, connections, databases, components and graphic interfaces. One of the forms currently used for the reconstruction of pieces of software is total and direct migration from the legacy application. This type of migration demands a great deal from the software engineers, who need to have as much knowledge of the technology used in the legacy application as that used in the new application. Furthermore, legacy applications generally don't possess documentation. An alternative for the reduction in time and complexity in the migration from legacy applications would be the identification and separation of rules that govern business and technology. This separation would permit the gradual migration from the legacy application and coexistence between the legacy application and part of the reconstructed application, lending flexibility to the migration. Therefore, the objective of this project is to make migration from legacy applications viable and secure for businesses. What is proposed is an approach to gradual migration, guiding the software engineer in the reconstruction of that application and integrating tools and new techniques such as, for example, Refactoring, Web Services and EAI.

311 SGEP - System for the Strategic Management of Projects; Computerized System for the Tracking and Management of Projects, Geared Towards Decision Makers

Coordinator:
Daniel Estima de Carvalho

Company:
Easylearn S/C Ltda.

Approved value:
Phase 1: R$ 30,899.99

The System for the Strategic Management of Projects (SGEP) aims to supply critical information on projects to its users. The system centers on the project manager, who will be the main source of information, but it focuses on the tracking that must be done by directors or coordinators, providing a broad vision and enabling greater control over projects of a strategic nature. The idea is that the system tracks, in a synthetic manner and with focus on exceptions, the entire life-cycle of a project. Once installed, it allows for a standardization of procedures and methodologies in project management. By using it, a technical memory of projects is created which serves as a base for the management of knowledge in the organization. With a structured workflow in which the system requests approval of the information sent out by the manager, the system integrates those at higher levels in an organization who need to receive project information. In addition to the private sector, this product is also aimed at public agencies, such as secretaries of state and municipalities. The commercial impact of this product is high, owing to the growing need for project management support tools and the lack, at the present time, of integrated solutions for the tracking of a portfolio of strategic projects. In the area in which some public organizations operate, its application is of fundamental importance to increase efficiency and transparency in the management of resources.

312 Technological Development Platform for Precision Irrigation of Perennial Crops

Coordinator:
André Torre Neto

Company:
Enalta Inovações Tecnológicas para Agricultura

Approved value:
Phase 1: R$ 61,060

Around 70 per cent of potable water on the planet is used in agriculture. Charging for the supply of water resources in rural areas, which has been adopted to combat waste and promote the rational use of water brings with it, however, negative consequences for agribusiness. This situation shows that it is vital to develop technologies for the rationalization of water use in irrigated systems, making production possible, without nevertheless causing negative impacts in society. This project aims to develop an automatic system for precision (spatially differentiated) fertirrigation in perennial crops, under irrigation by micro-watering or drip irrigation. The system will have sensor devices and intelligent activators linked by a wireless network. Based on this network, a piece of software will be produced to handle the differentiated application of water and fertilizers, which should monitor biotic and abiotic parameters in the production system, allied to conventional and non-conventional information and methodological technologies for the space-time analysis of data. The system will be developed ini-

tially for citriculture, owing to its economic importance in the state of São Paulo, because of the logistics made available and pressing need in the face of the sudden death of citrics. However, being versatile and capable of being implemented in stages, it will be easy to adapt it to other perennial crops, such as fruit and coffee growing in general.

313 Development of a Computational Tool for the Design and Analysis of Networks of Optical Packets

Coordinator:
Antonio Marcos Alberti

Company:
Ignis Comunicações S/C Ltda.

Approved value:
Phase 1: R$ 63,044.20

To make use of the entire transmission band which optical networks based on WDM (Wavelength Division Multiplexing) technology permit, different technologies have been and are being developed such as: broadcast-and-select, routing, Optical Packet Switching and Optical Burst Switching. Studies on networks based on optical packets began at the end of the 1990s. It involves a new and promising technology which seems likely to revolutionize optical systems even further. In the belief that the development of new devices and systems based on these innovations will create a demand for computational tools for these networks, as happened with WDM, IgnisCom is proposing the development of a commercial tool for the design and planning of optical packet networks. The objective is to offer an unprecedented product, which will be launched on the market before others that include this technology. Besides the innovative technology in the modeling and analysis of optical packet networks, the proposed tool will also have some innovations in its architecture, amongst which we can highlight: Simulation Integrated with Planning, Dynamic Project Manager, Optimization of Parameters Link and Expandable and Modular Library of Models.

314 Development and Characterization of Blends of Ethylene Polyterephtalate Recycled/Polycarbonate (PETr/PC)

Coordinator:
Arioaldo Peronti Barboza

Company:
BCB Comércio de Sucatas Plásticas Ltda.

Approved value:
Phase 1: R$ 19,871

This project aims to develop and evaluate the technical viability of blends of recycled PET – (PETr) – and polycarbonate (PC), using chemical compatibilization in a continuous extrusion process. The objective for obtaining these blends is to take advantage of the individual characteristics of their components in a single material. In PC, the characteristics would be resistance to impact and good temperature performance and, in PET, stiffness and chemical resistance. Since PET is a post-consumption material and recycled from carbonated drinks packaging, it would be characterized as technological innovation, which would result in an excellent cost-benefit relationship for the product. The material to be developed could be used in engineering, in direct replacement for other thermoplastics and other blends such as polyamide (nylon), ABS, ABS/PC, PBT/PC and others, in injection processes in technical parts in the automobile industries, in hermetic compressors, in household appliances and electroelectronics. In preliminary contacts with the automobile industry, the need to use quality recycled materials in their products was emphasized. As yet there is no national supplier meeting the technical requirements of the material at a suitable cost.

315 Integrated Robotic System for the Areas of Education, Research and Entertainment

Coordinator:
Claudio Adriano Policastro

Company:
Cientistas Assoc. Comércio, Representação, Consultoria e Treinamento Ltda.

Approved value:
Phase 1: R$ 74,908.74
Phase 2: R$ 318,859.65 / US$ 4,206.15

The objective of the system is to offer an integrated environment with mobile robots and support software for the programming and development of teaching activities to act in three specific areas: education, research and entertainment. This project proposes the development, the application and the transfer of technology from three sub-areas of infor-

mation technology: Robotic Intelligence (RI), Artificial Vision (AV) and Automatic Speech Processing (ASP). These areas offer a high degree of originality and relevance for the scientific and industrial environment in relation to man-machine communication through voice and artificial vision. The importance of this project derives from the application of innovative technologies in RI, AV and ASP, to produce a national software and hardware kit applied to educational and entertainment robotics. In phase 1 of the work a main module with a robot base, a prototype of the Vision Module, a Radio-Modem Module and an Integrated Robot Programming and Control Environment were successfully developed. In phase 2 it is intended to take forward the development of the modules planned for this stage: Interactive Module, Image Processing Module, Infrared Vision Module, Grip Module and Voice Module.

316 Construction of a Metals Nitriding Plant Using a New Technology of Pulsed Plasma

Coordinator:
Daniel Wisnivesky

Company:
Industrial Heating Equipamentos e Componentes Ltda.

Approved value:
Phase 2: R$ 276,400

The plasma nitriding of metals is a thermochemical process which allows the properties of surface hardness to be altered, improving the resistance to wear, to corrosion and the material's thermic resistance. The process is used in the treatment of ferrous metals, refractory metals and, more recently, aluminum. The nitriding of surfaces is used, among others, in the mechanical, automotive, hydraulic, metallurgical, biomedical and food industries. The process is used in the treatment of plastics injection molds for automotive parts (valves, gears and pistons), aluminum extrusion dies, tools for cutting and machining metals, perforations for casting molds in general and in the treatment of prostheses, among others. This project proposes the building and exploitation of a plasma nitriding plant, of medium size, using the concept of a furnace with multiple independent cathodes with the following objectives: 1) innovate in the functioning of the pulsed plasma nitriding furnace by using the technology of modular furnace with multiple independent cathodes; 2) to offer metals surface nitriding service using a clean and modern technology and a controlled and reproducible process; 3) manufacture and commercialize complete plasma nitriding plants.

317 High Precision Intelligent Piezoresistant Pressure Transmitters for Aggressive and Non-Aggressive Environments

Coordinator:
Edgar Charry Rodriguez

Company:
Mems Microsystems Integrados Híbridos de Pressão, Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 61,692.12

The aim of this project is to build a prototype intelligent piezoresistant pressure transmitter which amplifies the pressure sensor signal and is adapted using programmable amplifiers and 16-bit CPU on a single chip. In this method, the pressure and temperature signals are treated and presented as input in the programmable amplifier, effecting the amplification, calibration, linearization and temperature compensation of the sensor signal. This transmitter can be exposed to aggressive and non-aggressive environments, being used in the measurement of gases and liquids compatible with AISI-316 steel at different temperature ranges and working pressures. The equipment is suitable for industrial applications, automotive diagnostic systems, hydraulics and other segments of the market that require high precision, high performance and excellent quality. The transmitter prototype should have: process connection nipple; environmentally-isolated piezoresistant pressure sensor; printed circuit board with signal conditioning chip; discrete components; tubiform steel casing; and electric connection.

318 Development of Alumina-Based Cutting Tools

Coordinator:
Edval Gonçalves de Araújo

Company:
Macea Cerâmica Técnica Ltda.

Approved value:
Phase 1: R$ 49,900 / US$ 6,000

Currently, alumina-based cutting tools are not produced in Brazil. Their main application is in the machining of tempered steels and cast irons, materials widely used in the metal-mechanics industry. With this project, it is intended to transfer to Macea Cerâmica the fine ceramic technology developed in the Ceramics Department of the Institute for Energy and Nuclear Research (Ipen), for the company to manufacture and commercialize the inserts. The market for alumina inserts is in full expansion in Brazil, because the modernization of the country's industrial base presupposes the purchase of high-performance machinery and, consequently, with high cutting speeds, in which ceramic pellets have their application. In the use of cutting tools for cast iron and tempered steels, it is necessary to increase the hardness of the alumina with the addition of titanium or niobium carbide, to condition the powder by grinding and/or to use the spray dryer technique, followed by hot-pressing of the powder. The sinterization should be carried out in an argonium atmosphere in temperatures of the order of 1700°C for periods under 60 minutes. The final stage is the correction/polishing of the pieces. The proposal of this first stage of the project is to define the compositions and the process to produce inserts from alumina-based compounds with a geometry widely sought after in the industry and test those parts directly in companies.

319 Project Workshop Kit

Coordinator:
Irene Karaguilla Ficheman

Company:
Criartec Indústria, Comércio e Serviços de Materiais Didáticos.

Approved value;
Phase 1: R$ 46,969

The main objective of the Project Workshop Kit is to research and develop products aimed at guided learning through the solving of problems by means of carrying out projects. This proposal will serve as a tool in the area of technology education for children and adolescents, in the formal sphere (primary and secondary), in the non-formal sphere and in home use. The project will be developed through a partnership between Criartec and the Laboratory for Integratable Systems of the University of São Paulo's Polytechnic School (LSI-EPUSP). The kit should comprise a complete set of building blocks consisting of printed circuit boards, electroelectronics components and the respective support material, which will allow for multiple combinations. The blocks will be divided in three types: entry, processing and exit, each one containing corresponding elements and effective functioning, regardless of whether or not there is a computer. Given the lack of attractive learning tools and materials in this educational sector, the project could fulfill an important function as a demystifier of technologies that nowadays are seen as black boxes. The implementation and testing of a prototype of the kit should serve as a basis for the manufacture and commercialization on a product scale.

320 Development of PET-recycled/ABS Blend

Coordinator:
Irineu Bueno Barbosa Junior

Company:
BCB Comércio de Sucatas Plásticas Ltda.

Approved value:
Phase 1: R$ 18,296
Phase 2: R$ 400,000

The environmental problems caused by the incorrect disposal of polyethylene-terephthalate (PET), can be minimized by recycling, which avoids the accumulation on rubbish dumps and reduces the consumption of petroleum. Depending on the technology involved in the recycling process, it may be possible to take advantage of the excellent properties of this thermoplastic (recycled PET) in quality applications such as engineering, adding a significant value to it. For this type of use, it is necessary that the thermoplastic demonstrates a good relationship between the properties of hardness and resistance to impact. Phase 1 of this project evaluated the technical viability of blends of recycled PET and Acrylonitrile Butadiene Estirene (ABS), aiming for its use in replacement for different engineering thermoplastics. The results showed that the blends developed have an excellent cost-performance relationship, with great potential for replacing different engineering thermoplastics in injection processes of technical components, in sectors such as the automobile, electroelectronics, household appliances and telecommunications sectors. With its commercial viability proven, the objective of phase 2 of the project is the study of the behavior and adaptability of the new materials to the production

processes of future customers, undertaking try-outs of injection of technical components with pilot batches with additives. It is also intended to carry out trials and performance tests on injected components.

321 Improvement to the Quality of Recognition and Availability (SpeedCluster) of Griaule's AFIS

Coordinator:
Iron Calil Daher

Company:
Griaule Technology Ltda.

Approved value:
Phase 2: R$ 296,000

Griaule developed and commercialized a Brazilian system for the identification of fingerprints (Automated Fingerprint Identification System, AFIS). The software is in use in the states of São Paulo, Rio Grande do Norte, Sergipe and Tocantins. Tests conducted internally, based on the procedures of the University of Bologna (Unibo), demonstrate that, out of 28 international competitors, the product lies in tenth position. The first objective of this project presented here is to improve the system's recognition rate. Adopting the EER (Equal Error Rate) metrics, widely accepted, and taking as a reference Unibo's ranking, the intention is to achieve, in relation to that rate, an EER lower than 0.9 per cent. The second objective is to increase the availability of the Griaule AFIS using the cluster concept, guaranteeing the system's continuity in case of the failure of one of its servers. The improvement in recognition involves the pre-processing of the digital images, the treatment of distortion and the segmentation of the images and the use of morphological information, among other topics. As for the increase in availability, the development of a search queuing scheme, fault tolerance and load distribution is envisaged. The expected result is a piece of AFIS software suited to the Brazilian reality, at a low cost and of high quality.

322 Design and Construction of Self-Service Intelligent Kiosk for Demonstration, Adaptation and Commercialization of Spectacles On-line

Coordinator:
Jarbas Caiado de Castro Neto

Company:
Ótica Online Ltda.

Approved value:
Phase 1: R$ 21,050
Phase 2: R$ 310,003.75

The aim of this project is to develop and build an automatic, self-service, intelligent kiosk for the adaptation, testing and commercialization of spectacles. This solution is the result of the company's experience in the sale of spectacles via the internet, in which problems of credibility in the process were noted, due to the lack of physical presence and measuring instruments and calibration of the patient's optical data. The development of this kiosk should also offer a virtual on-line trial of the available frame models. The Digitok authoring system for self-service solutions will be used to create products in three modules. These modules provide the main functionalities for the building of self-service applications, from access to the database up to the remote management and monitoring of procedures. The technologies used in the development, both the authoring systems and the resultant applications, aim for the perfect integration of different environments, using standardized tools and components. The installation of the kiosk will use interactive forms of software, which will be able to integrate various devices such as touch-screen, printers, cameras, microphones, media recorders, presence sensors, bank card and bar code readers, and coin and note collectors, among others.

323 IrisVision - The Eyes of Your Business

Coordinator:
Jean Paulo Agostinho

Company:
JM Technology e Systems Ltda.

Approved value:
Phase 2: R$ 150,950

There is a lack on the market today of a technology which can indicate what a user does after his authentication and authorization to enter a system. It is not known whether he uses it effectively or appropriately, nor is it known how much his processing of data costs the company. The objective of this project is to create a new technology capable of tracking the user's behavior in a particular application. To achieve this, an experimental approach will

be used, in which various data-capturing techniques will be employed to create the user personality in a system. Given the large amount of data to be stored, it will be necessary to use advanced techniques of data storage and compression. The expected result is a prototype which demonstrates that the technology developed is able to detect a divergence in the user's behavior. In this way, it will be possible to avoid the loss of resources and enable swifter preventative and/or corrective actions in the case of improper access or fraud, minimizing the negative impacts the company could suffer.

324 Development of a Process to Hot Vulcanize Ten Tires Simultaneously, Research into the Heating Curve Parameters During the Vulcanization Process for Retreaded Tires, with Automation of the Machine

Coordinator:
Jorge Hideyassu Chinen

Company:
Camelback Comércio de Pneus de Santos Ltda.

Approved value:
Phase 2: R$ 221,494

The observation of the inefficiency of a project with more than 40 years without innovations and the evidence of constant customer complaints about the guarantee of a repaired product which often lasted only a few days, led the company to the decision to develop new methodologies to refine the tire vulcanization process. This project's objective is to build a piece of equipment to hot vulcanize ten tires simultaneously and introduce a vulcanization control system by means of monitoring of the heat curve of the camelbak, with the automation of the equipment. In this way, the intervention of operators during the process is reduced and the quality of the final product is guaranteed, since the software developed accompanies the entire operation, correcting the temperature and the vulcanization time necessary to guarantee the uniformity of the repaired tire. A system was developed of doing away with two accessories which are used during the conventional process, allowing for all ten repaired tires to maintain the same internal pressure by means of compartmentalization. Thus, all the tires are brought together in a single pressure chamber, which is controlled during the vulcanization and kept stable during the entire repair process.

325 Ultra-Sound Tartar Remover for Use in Dentistry

Coordinator:
José de Jesus Capellaro

Company:
GGDent Comércio e Serviços de Artigos e Equipamentos Odontológicos Ltda.

Approved value:
Phase 1: R$ 24,113

This project aims to research and develop an ultra-sound tartar remover for use in dentistry, employing totally national mechanical and electronic solutions. The equipment used to remove tartar, also known as scalers, come in two types: pneumatic or ultra-sound. The latter offers advantages in terms of durability and efficiency, but is inaccessible to most dental surgeons due to its high cost. The research and development of this equipment will operate on five work fronts involving: 1) ultrasonic scaler: uses piezoelectric elements, mounted in a mechanical unit suitable for the handling and refrigeration of the whole device (hand-piece); 2) tips: these are attached to the ultrasonic scaler, and can offer different formats depending on the procedure to be applied. Different models for tips will be developed, involving research on materials (steels) and hardening processes suited to their use; 3) solenoid valve: used to control the flow of water; 4) microcontrolled electronic control module: responsible for the control of the solenoid valve and the high tension generator, necessary for the functioning of the ultra-sound scaler (approximately 500 volts); and 5) cabinet: in which the electronic control module, the solenoid valve and the hand piece (containing the ultrasound scaler) are stored.

326 Development and Manufacture of Mono and Bi-Propellant Injectors for Low Thrust Thrusters Produced Through the Process of Solid State Diffusion Soldering

Coordinator:
José Nivaldo Hinckel

Company:
Diprofil Forjamento Rotativo Ltda.

Approved value:
Phase 2: R$ 304,480

Recent advances in the development of apogee motors installed in artificial satellites have created an ever greater demand for highly reliable, low weight bi-propellant injectors with reduced energy consumption. Since such components are produced by refined machining processes and electro-erosion, creating a complex network of interconnected cuts and cavities crucial to their functional performance, distortions, obstructions and any sort of plastic deformation stemming from the conventional soldering process must be avoided. This project is aimed at the development and manufacture of these injectors, which consist of three plates produced from a nickel-based superalloy (Inconel 600). When soldered together, they make up two independent internal circuits, into which anhydrous hydrazine is injected into the fuel circuit and nitrous tetroxide into the combustion circuit. These fluids, when they combine, produce a spontaneous reaction thus producing the burn which initiates the functioning of the motor and generates a thrust capable of stabilizing the entire satellite and dislocating it from an elliptical orbit into a circumferential orbit. This soldering technology, besides being promising for aerospace application, can also be used in medical implants and in the automobile industry. To date, no devices with such flight qualified characteristics exist in the national market.

327 Development of a Monitoring System for Multisensors

Coordinator:
Juarez Felipe Junior

Company:
Sensis São Carlos Indústria e Comércio de Equipamentos Eletrônicos Ltda.

Approved value:
Phase 1: R$ 47,000
Phase 2: R$ 207,200

Supported by FAPESP, Sensis developed the basis of the DM42 product, an acoustic emission monitor which is on the market today. Currently, other competitor companies are manufacturing monitoring systems which enable multisensor functions and advanced signal treatment options. The question is that DM42 can only cope with acoustic emission signals, because the hardware adopted is cheaper and more limited regarding signal treatment options. With this project, the company proposes the first high frequency acoustic emission monitoring system to use digital processing of signals (DPS). In its first phase, the objective of the project was to verify the technical viability of using modern and inexpensive versions of DPS systems for application in monitoring processes. The new system needed to be flexible enough to have its filtering parameters defined by software, or even the execution of Fourier transformations for the analysis of processes in a low cost piece of equipment. This first phase of the project was approved and concluded successfully, and the proposal for phase 2 is to carry out research on the definition for a prototype of the entire system. This new prototype should be tested in production environments to examine the new functionalities that could be applied.

328 Development of Gravimetric Titrator

Coordinator:
Kenneth Elmer Collins

Company:
Tech Chrom Instrumentos Analíticos Ltda.

Approved value:
Phase 2: R$ 145,703

The titrator employs a gravimetric burette, which holds some beakers with different titration solutions attached to the weighing chamber of an electronic balance at the base of the chamber. The addition of solutions is controlled by electromechanical valves. The titrator carries out potentiometric, biamperometric, spectrophotometric analyses, standard addition and preparation of standardized solution. The main advantages of the gravimetric titrator are the absence of error caused by differences of viscosity in the solutions, as well as volumetric variation due to thermal dilation, when dispensing calibration from glassware. The use of the electronic balance provides fast, automated results, controlled by a microcomputer, in addition to offering reproducibility and precision unobtainable by volumetric methods. The prototype tested consists of a metal support structure, with a capacitive sensor installed in the upper part and it operates with a load capacity of 100 grams and sensitivity of one milligram. A mechani-

cal arm links the sensor to a suspended platform with the beakers of solution, made of teflon. The beakers have in their base, an air admission orifice to compensate for the entry or exit of solution via capillary tubes connected to three-way valves. The normally open exit position of the valves is joined by capillaries to two-way valves connected to the external reservoirs. When one of the two-way valves is switched on, the corresponding solution flows from the reservoir into the suspended beaker, filling it. When one of the three-way valves is switched on, the solution contained in the respective suspended beaker is released, by gravity, into the reaction beaker by means of capillary tubes. The transferred mass is monitored by the gravimetric sensor and the entire operation is controlled by software. The internal beakers have the lower level of solution monitored by optical sensors, and they fill up automatically. The upper level is controlled by means of the mass of solution admitted. The communication of the titrator with the microcomputer is performed via an RS232 serial interface. The automated gravimetric analysis, proposed in this project, faces competition from volumetric analysis, automated or manual. The gravimetric technique has the advantage of not being subject to the thermic effects of volume dilation, alterations in the concentration and the viscosity, nor from lengthy calibration procedures. The digital analytical balance, connected to the microcomputer, allows the replacement of volumetric techniques by gravimetric ones, without the disadvantages mentioned. The drastic reduction in time and consumption of reagents afforded by the use of the gravimetric titrator and the operational rationalization of the automated analysis offered contribute to the swift off-setting of its cost. The popularization of automated gravimetry depends merely on the commercial availability of the equipment.

329 Development and Qualification of 5N Mono-Propellant Satellite Thruster

Coordinator:
Lauro Benassi

Company:
Fibraforte Engenharia Indústria e Comércio Ltda.

Approved value:
Phase 2: R$ 293,500

Fibraforte is responsible for the supply of the Propulsion Sub-system for the Multimission Platform (PMM), under contract from the Brazilian Space Agency, and is interested in qualifying and supplying its own 5N thrusters, now in development, for this program. In order for these thrusters to meet the PMM requirements, they need to be subjected to an extensive qualification program, involving manufacturing processes, functional performance, environmental compatibility (vibration and thermic) and durability in the specified operation regimes. In addition to this, their propellant injection system needs to be refined, so as to reduce internal tensions on the catalytic bed, creating favorable conditions for the use of catalyzers with less mechanical resistance. There is also interest in nationalizing the iridium catalyzer supported on porous aluminum, a strategic component in the thruster which, historically, has been imported from the United States under strict controls by that country. It is proposed therefore, to carry out a qualification program for the 5N thruster and national catalyzer divided in the following stages: 1) development and functional and pre-qualification tests of the thruster; 2) functional tests of the national catalyzer; and 3) qualification tests for the 5N thruster and comparison between catalyzers.

330 Development of Anti-evaporation Mixture for the Conservation of Fresh Water

Coordinator:
Marcos Eduardo Sedra Gugliotti

Company:
Lótus Química Ambiental Ltda.

Approved value:
Phase 1: R$ 37,100
Phase 2: R$ 230,650

Faced with the supply crisis in some regions of Brazil and in the world, the company realized that the conservation of fresh water has become a business opportunity. This project describes the final stage of development of a chemical product which uses the technology of the formation of monomolecular films of biodegradable surfactants to reduce water evaporation. The product should be used in minimal quantities, will not harm the environment and can be applied in electricity generation reservoirs, the public supply and irrigation. The target public ranges from governmental agencies to private electric energy businesses, in addition to rural producers. In the second phase of the project tests

will be carried out on the process of batch manufacturing, with batteries of toxicological and physico-chemical tests to characterize the mixture, and experiments in evaporation reduction in the laboratory and in the field. Experiments in lakes or reservoirs should reveal the efficiency of the product in real conditions. The reduction in evaporation will be determined by existing well-established methods using, principally, class A evapometers. It is believed that this product should have a high socio-economic impact, especially in regions where there is a shortage of water, such as the North-East of Brazil.

331 Development of a process for Recovery and Recycling of Rhodium from Waste Metal in the Semijewels Industry

Coordinator:
Marcos Spitzer

Company:
Água Limpa - Bertazzoli & Ragnini Ltda.

Approved value:
Phase 1: R$ 23,700

This project aims to apply and refine a process for the recovery of metal rhodium deriving from different stages in the industrial production of semijewels. The process should consist of chemical or electrochemical stages, or both combined, for the separation of rhodium from the metal substrate and its transformation into rhodium sulfate. The immediate application of rhodium sulfate will be its introduction into electrodeposition baths for the manufacture of semijewels. In the jewel and semijewel industry, rhodium is deposited in fine layers on pieces such as earrings and rings, initially made up of a base metal, generally copper. At the same time as the pieces are being covered, the tying wires, hooks and electrical contacts in the electrochemical baths are also covered with rhodium. The last two are reused for a new electrodeposition, while the tying wires are useless after removing the pieces from the hook. To reuse the rhodium fixed on these wires, this project proposes to implement and evaluate different stages: to verify the purity of the starting material; to carry out the separation of the rhodium from the base metals by means of chemical or electrochemical dissolution; dissolution of metal rhodium, using procedures of electrochemical dissolution or in melted salts; production of rhodium sulfate and purification of that salt. With subsequent mastery of these techniques, rhodium may be transformed into other salts.

332 Development of New Functionalities for TopImplant Equipment

Coordinator:
Mario Alexandre Gazziro

Company:
Adiel Comercial Ltda.

Approved value:
Phase 1: R$ 17,240

AdieI developed and commercialized Toplmplant equipment, which meets the needs for precision and durability in the national dental market for implantology. The aim of this project is the adaptation of equipment already developed, so that it can store all the information obtained during the surgical procedure – currently only exhibited in real time – and, subsequently, link this data to the results evaluated by the surgeon. Such information will be used for later analysis by the professional, as well as being able to be sent to the company's clinical team, with the due authorization of the owner, by internet, to assist in the development of new recommendations for surgical procedures. On the basis of extensive reuse of the codes already developed, it is hoped to improve the equipment in question to make it more competitive on the international market and possibly, provide it with unprecedented functionalities in world implantology.

333 Classifier/Selector Machine for Oranges Using Computational Vision

Coordinator:
Reinaldo Augusto da Costa Bianchi

Company:
Digital VXIA do Brasil Automação Ltda

Approved value:
Phase 1: R$ 35,900

The cultivation of oranges has experienced vertiginous growth in the last few years owing to the increased internal and external market. Among the factors that have driven this expansion is the devalued exchange rate, the policy of strengthening exports and standardization and quality control

initiatives. One of these initiatives was the creation of the Brazilian Program for the Modernization of Horticulture, in which a norm for the classification of oranges was established. What has prevented many producers from adhering to the program is the fact that it employs human visual inspection, which is slow, expensive and often outside the expected norms. This project intends to develop an orange classifying/selecting machine suited to the Brazilian economic reality and which complies with the established standardization system. This technological innovation is opportune given that no similar machine is built in Brazil which can undertake the classification of oranges not just according to weight and size, but also according to their visual attributes; and that, in contrast to imported machines, is suited to the characteristics of the national fruit, offering local support and maintenance, in addition to a price accessible to the small to medium producer. With a prototype built and tested, which processes an orange per second, the aim of the second phase of the project is to evolve to a machine capable of processing around 15 oranges per second.

334 Security Logistcs System Using GPS

Coordinator:
Ricardo José Martines Ribeiro

Company:
Excelerator Consultoria e Serviços S/C Ltda.

Approved value:
Phase 1: R$ 73,466.86

The aim of this project is to develop a system for the monitoring and geographical location of fleets, in real time, using different technologies, especially GPS (Global Positioning System) with transmission of data via radio connection. The system consists of a hardware device which captures the data and sends it via radio, and software, which plots the referred image on a georeferenced map. The prototype initially proposed seeks to solve logistical problems experienced by the Military Police (MP) in their response to incidents, but it is a fact that problems of this nature do not just hamper the police. When the intended prototypes are built it will be an important step not just for the realization of the project, but also for creating a public safety tool. Faced with the concern with rising violence, the solution proves to be a good example of technology used for the social good. It is with these principles that the project seeks to evolve, combining efforts in research, development and production in academic and security institutions as well as private enterprise. Those mentioned are represented respectively by collaborating teachers at the University of São Paulo in São Carlos, by the 380th Battalion of the MP in São Carlos and by 3WT, a company specialized in development technology.

335 Development of Dental Porcelains for the Making of Dental Prosthetics

Coordinator:
Roberto Queiróz Martins Alcântara

Company:
Angelus-Lab Laboratório de Pesquisa Ltda.

Approved value:
Phase 1: R$ 65,452

Among the restoration materials used in dentistry, ceramics are the oldest and most widely used for the making of prosthetics. Ceramics offer countless advantages, such as: extreme hardness, high resistance to compression and wear, chemical inertia, color stability and, principally, excellent esthetic properties. However, as it is an imported material, it represents a high cost, precisely due to duties and the fluctuating dollar price. The development of a national product with characteristics similar or superior to imported dental porcelains and at a lower cost is an object of great interest, for professionals in the area as well as for society. Therefore, in the first phase of this work, physico-chemical characterizations of the main lines of commercial porcelains used as covering for metaloceramic restorations will be carried out. This will enable the definition of process parameters that will be adopted in two routes of synthesis: the mixture and fusion of oxides and processing of polymeric (Pechini) precursors. Once the main physical and chemical properties have been reproduced, application tests will be carried out together with professionals specialized in the area.

336 Development of Complementary Organic Foods for Children

Coordinator:
Rogério Lopes Vieites

Company:
Refazenda Grumo Manufatura e Comércio de Gêneros Alimentícios Ltda.

Approved value:
Phase 1: R$ 19,800

Fruit and vegetables are the main source of vitamins and obligatory ingredients on any nutritionally balanced menu, including that of children. The objective of the present work is to produce six commercial types of complementary organic foods for infants, with quality nutritional, sensory and microbiological standards and with long shelf life. It should be stressed that organic agriculture is a broad and varied spectrum of practices with biologically and ecologically correct principles. In the preparation of these foods, products of vegetable origin will be used, such as squash, white rice, sweet banana, beetroot, broccoli, carrot, spinach, beans, yam, lima orange, papaya and cassava, cultivated in the region of Botucatu (SP). Subsequently, nutritional and centesimal analyses will be performed, sensory evaluation using the Moraes (1985) guidelines, and microbiological analysis in relation to the parameters required by RDC nº 12, a resolution adopted by the National Agency for Health Vigilance (Anvisa), in addition to the enumeration of moulds and yeast and the standardized heterotroph counts. The commercialization of these products should be handled by several grocery chains, located in São Paulo and in Rio de Janeiro.

337 Optical Service Channel

Coordinator:
Sergio Barcelos

Company:
FiberWork Comunicações Ópticas Ltda.

Approved value:
Phase 1: R$ 35,000 / US$ 12,700

The aim of this project is to develop a new piece of equipment for optical communication called Optical Service Channel or FWL210-CSO, which will transmit low capacity voice and data over optical fibers. This entails the first service channel designed and developed in Brazil acting in the optical domain on the international market. It should replace, with superior performance, the others existing on the market, which function entirely in the electrical domain. This project aims to cater for companies that have optical fiber networks, among which the operators of public switched telephone networks, broadband access providers and public utility companies. FWL210-CSO should enable long distance voice and data communication over optical fiber without the need for intermediary layers of communications equipment. To effect the low capacity communication envisaged by this project, these layers make the investment unnecessarily expensive. FWL210-CSO will also enable integration with the customer's PABX telephone and connection to the public switched telephone network, allowing access to external connections from any node on the network. In this way, engineers and technicians in the field will be able to communicate amongst themselves, from telecommunications stations, with the company's offices using fixed phones and external cell phones and make conference calls. The equipment will operate as open channel, in the same way as the electric service channels in which all the nodes on the network will have simultaneous access to conversation (multiple access). The Optical Service Channel will also offer restricted channels, so that the signal will be regenerated in the node without, nevertheless, allowing local access.

338 Optical Cross-Connect with Liquid Crystal Based Switching Matrixes

Coordinator:
Sergio Barcelos

Company:
FiberWork Comunicações Ópticas Ltda.

Approved value:
Phase 1: R$ 48,000 / US$ 8,455

This project aims to develop optical cross-connects-OXC with switching matrixes based on liquid crystal. The work will entail: 1) development of optical switches based on liquid crystal; 2) design of the cross-connect architecture using the optical switches created; 3) integration of the optical switches in accordance with the designed architecture; and 4) development of the equipment's control and management interface. FiberWork benefits from collaboration with the Renato Archer Research Center (CenPRA), internationally recognized in the research and development of liquid crystals. The function of an OXC is to optically switch the wavelengths of different customers in the WDM (wavelength division multiplexing) optical layer. The use

of OXCs is vital for the working of dynamically reconfigurable optical networks and is ideal for the application of liquid crystal (LC) technology in the OXC nucleus. This is because LC offers a performance comparable to competing electromechanical devices, yet with the reliability and efficiency of solid state devices, in addition to being transparent in relation to bit rates and protocols. The OXC proposed by FiberWorks is looking to establish itself in the market of metropolitan networks, access networks and company networks, which use the CWDM (coarse wavelength division multiplexing) technology, and also in the market of long-distance networks, which use the DWDM (dense wavelength division multiplexing) technology.

339 Development of Material in the Form of Filament of the ABS Type for Use in FDM Rapid Prototyping Machines

Coordinator:
Sergio Luiz Dulcini

Company:
Oriel Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 57,430

The submitted proposal aims at the development of consumable materials used in rapid prototyping machines of the FDM type, with the aim of reducing the cost of making prototypes in Brazil and abroad. The project involves the characterization of the material through the following analyses over an ABS filament: infrared spectroscopy, capillary rheometry, permeable gel filtration chromatography, diffractogram of inorganic charges, thermogravimetric analysis, dynamic-mechanical analysis, electronic sweeping microscopy, co-rotating twin-screw extrusion and sample preparation in ARBURG injector. Following these analyses, research will be undertaken into materials of the ABS type (Acrylonitrile Butadiene Estirene) commercialized in Brazil and sold in pellets used in mixture which results in a compound with characteristics similar to those of imported ABS. This material will be inserted in a co-rotating extruder with a cylindrical orifice die, so that in the extrusion, a cylindrical filament calibrated at 3 millimeters thickness emerges. This filament will then be fed into the FDM machine in order for prototypes to be made with mechanical and geometrical properties similar to those used by an imported filament.

340 Identification System for Polymorphisms

Coordinator Project:
Zanoni Dias

Company:
Scylla Informática S/A

Approved value:
Phase 2: R$ 93,800

The main objective of this project is to carry out research with a view to creating a piece of software for the identification and analysis of single nucleotide polymorphisms (SNPs) which could be competitive on the national and international markets. This system should combine the following advantages: 1) reliability: analyses based on advanced algorithms and statistical techniques; 2) speed: the data batches will be analyzed in a day (currently the average time is 15 days); 3) convenience: all the information required for the analysis of the batch, even including the visualization of electroferograms, are brought together in a single piece of software; 4) sharing: several researchers can work on a common database; and 5) versatility: application for different types of organisms (diploids, polyploids and virus populations, among others.).

341 Method for Increasing Productivity Based on the Fixation of the G2 Allele in the Promoting Region of the Growth Hormone Gene in Slaughter Cattle

Coordinator:
Sergio Ulhoa Dani

Company:
GENON - Genética Molecular, Pesquisa & Development Ltda.

Approved value:
Phase 1: R$ 38,835

Genon proposes a method of increasing productivity based on the fixation of the G2 allele (or long allele) in the promoting region of the growth hormone gene (bGH). The characterization and quantification of the gain deriving from the fixation of the G2 allele in controlled herds of three breeds of zebu (Nelore, Gir and Guzerá) and one bull breed (Caracu), will be undertaken using DNA genotyping

by polymerase chain reaction (PCR), restriction fragment length polymorphism (RFLP) and variance analysis. It is estimated that between 5 to 20 per cent of animals in Brazilian herds are carriers of the G1 allele, a short form of bGH. With the consolidated preliminary results indicating a negative effect of this short allele on the productive characteristics of slaughter herds and a positive effect of the long allele on those same characteristics, animals carrying the G1 allele could be preferentially discarded, and animals carrying the G2 allele could be preferentially bred, as part of a program of genetic improvement for increased productivity. Based on preliminary results, it is estimated that the application of the technique on the national herd could represent an annual gain of the order of 150 thousand tons of meat for the country, obtained simply by means of the increase in productivity and competitiveness in the production chain. This will bring economic, ecological and social benefits to an entire sector based on the agribusiness breeding slaughter cattle.

17th BIDDING INSTRUCTIONS

342 Development of Automatic Electrolytic Extractors for Heavy Metals in Effluents

Coordinator:
Alcídio Abrão

Company:
Khemia Equipamentos Tecnológicos de Efluentes Ltda.

Approved value:
Phase 1: R$ 35,397

The project aims to demonstrate the technical viability of automatic electrolyzers capable of monitoring levels of silver ions in effluents. These ions are present in all emissions produced by companies that work with photosensitive materials, such as hospitals, printing businesses and photo labs. The electrolyzers should operate potentiostatically or galvanostatically in hydrodynamic regime, selectively electrodepositing the metal and operating in the flow directly at the source of the emissions, which are the film development machines. All the measurement and control of the process will be carried out automatically by a microcomputer of the PIC series. In series with an electrolytic cell, Khemia's equipment envisages ionic exchange filters and an automatic control valve, allowing the effluent from these machines to be discarded directly into the sewers, guaranteeing emissions always within legal norms. With consumption below 50 watts, the electrolytic extractors should recycle the used silver photographic fixers, prolong the useful life of the fixers and decontaminate the waste material.

343 Project for the Development of an Experimental On-board Module on a Low Orbit Orbital Platform – "Sara" Project

Coordinator:
Alfredo Otto Brockmeyer

Company:
Brockmeyer Space Engineering Ltda.

Approved value:
Phase 1: R$ 45,700

This proposal aims to design and develop an experimental on-board module (Modem) on a space platform, called Sara, forming part of its payload. Specifically, the Modem is an integral part of Sara, the project developed by the Aeronautical and Space Institute (IAE). The on-board module on the orbital platform will be launched into space by means of the VS-40 sounding rocket for sub-orbital flights or by the VLS-1 satellite launching rocket for injection into low earth orbit, for a duration of approximately ten days and controlled re-entry into the earth's atmosphere. The purpose of the Modem is to enable the setting up of scientific or commercial experiments for the testing and confirmation of physical, chemical or biological behavior in the microgravity environment. These researches have a very strong market appeal, since the knowledge and the discovery of properties intrinsic to the object of the experiment in the absence of the gravity acceleration factor, allows for development, discovery and improvement of products. As an example new medicines, vaccines, crystal growth and protein structures may be cited. There are also applications in the fields of physics and chemistry, such as the improvement in the composition of fuels or the examination of the behavior of complex mixtures of fluids.

344 Manufacture of Rectangular Dental Thread

Coordinator:
André Itman Filho

Company:
Tecnident Equipamentos Ortodônticos Ltda.

Approved value:
Phase 1: R$ 32,700

The study of the mechanical forces in the permanent deformations and in the breaking of dental thread generated an industry which uses high technology for the manufacture of components used in esthetic restoration. The choice of the appropriate thread is important at every stage of dental treatment. In the case of rectangular threads, used at the conclusion of work, the product is imported from a few suppliers. To avoid technological dependency and to cater for the needs of dentists it will be necessary to develop equipment capable of producing the rectangular threads in the dimensions suitable for the treatments. This project was prepared with the objective of developing a prototype-mill with adjustable cylinders. To establish the working parameters of the equipment, different stainless austenitic steel wires of the 300 series will be milled for rectangular transversal section. The microstructures and the final mechanical properties of the products will be evaluated after processing. In this stage, the control of procedures and the production of threads which conform to the normal specifications will be important. Based on these results, a new project will be proposed with the objective of building an industrial mill for the production of threads on a commercial scale.

345 Appropriate Disposal of Fluorescent Lamps which Contain Mercury

Coordinator:
Atsuko Kumagai Nakazone

Company:
Tramppo Serviços Industriais Ltda.

Approved value:
Phase 1: R$ 55,762

Economic development in the last century, combined with high indices of consumption, have transformed pollution into one of the major environmental problems. Among the various types of pollutant, greater concern is caused by those that incorporate heavy metals in their composition, among them the fluorescent lamp, which is the second greatest polluting source of mercury. Supermarkets, banks, universities, industries and commerce, are all known to have a very high quantity of fluorescent lights installed and most of them are discarded improperly in sanitary landfills. Their proper disposal has been the theme of studies which seek to obtain methods of decontamination and recovery of components. There is no information on the existence, in the national market, of manufacturers of equipment to fragment fluorescent lamps and recover the mercury. In Brazil, the companies that dispose of these lamps developed their own machines. For this reason, Tramppo Serviços Industriais intends to study the technical viability of the development of a machine displaying technological innovation, which uses vacuum systems combined with high temperature to capture the mercury in a simple, safe and economic manner. For this task, the company is going to request the support of the Institute for Energy and Nuclear Research (Ipen) and the Institute of Technological Research (IPT).

346 Process for Multiple Operations of Sterilization, Homogenization, Inoculation and Packaging, Aimed at the Production of Inoculants for the Cultivation of Edible and Medicinal Mushrooms

Coordinator:
Augusto Ferreira da Eira

Company:
Fungibras - Indústria e Comércio em Fungicultura Ltda.

Approved value:
Phase 1: R$ 68,700
Phase 2: R$ 290,000

The company intends to develop a technological innovation which aims to produce agricultural inoculants and substrates for the axenic cultivation of edible and medicinal mushrooms at substantially reduced cost and with greater guarantee of microbiological quality. This entails a process of mass dynamic sterilization, with equipment which enables multiple operations: homogenization of raw materials, cooking, sterilization under continuous homogenization (avoiding mass transport problems), cooling, inoculation and homogenization of the inoculant, extrusion and packaging of the inoculated substrate

(seed). In the first phase of the project, this process was compared with the conventional method of producing inoculants by static sterilization in autoclaves. The results obtained proved the technical viability of the operation and control of the new equipment in the production of inoculants, reducing the time/sterilization temperature binomial, contaminations from thermo-resistant bacteria and practically eliminating fungal contaminations. This stage also permitted the fast cooling, the inoculation and homogenization of the inoculant and the extrusion of the inoculated substrate (cereal grain). These advantages will permit an initial reduction on costs of the order of 40 per cent compared to the conventional process. However, on this scale (prototype with 850 liter capacity), it was not possible to operate the process for the production of substrates aimed at the axenic cultivation of mushrooms. Thus, in phase 2 it is intended, among other activities, to build full-scale equipment, with around 4,500 liters.

347 Development of Optimized and Economically Viable Process for the Production of Biosilicate for Treatment of Dentinary Hypersensibility

Coordinator:
Christian Ravagnani

Company:
Vitrovita - Instituto de Inovação em Vitrocerâmicos Ltda.

Approved value:
Phase 2: R$ 279,000 / US$ 7,118.64

The scientific and business communities have put a lot of effort into the search for more satisfactory products for the treatment of dentinary hypersensibility. Vitrovita's researchers developed on a laboratory scale, an innovative bioactive crystalline material, called biosilicate, which demonstrated excellent preliminary results in research *in vitro* and *in vivo* in the treatment of this hypersensibility. The objective of this project is to develop and optimize, up to pilot scale, an economically viable process for the production of biosilicate. The level of bioactivity of the material should be maintained in this stage, along with the percentage of crystallinity and crystalline phase and the purity and granulometric distribution appropriate for its use in the treatment and elimination of dentinary hypersensibility. To achieve these objectives, the company will develop research on the fusion of biosilicate, using different crucibles in the thermic treatments for the crystallization of the material and in its grinding so as to obtain the desired granulometric distribution. It is hoped, at the end of the project, to introduce on the market the first national product for the treatment of dentinary hypersensibility based on the concept of bioactive materials, offering greater practicality of the application, greater comfort for the patients and the lasting elimination of the problem.

348 Standardization and Validation of an Elisa Kit for the Quantification of Chloraphenicol in Products of Animal Origin

Coordinator:
Cyro Ferreira Meirelles

Company:
Ata Análise Tecnologia Comércio Representações Ltda.

Approved value:
Phase 1: R$ 50,300 / US$ 5,931.22

The control of toxic residues in agricultural and livestock products is the responsibility of the Ministry of Agriculture, which up until now has not carried out a significant statistical assessment of the annual herd slaughtered. The justification would lie in the fact that there is no national laboratory for the production of kits and in their high import cost. Meat importing countries in the European Union do not accept departures from health norms due to previous problems with the spread of diseases in their herds. In addition to exaggerated reservations in the market, the present situation is at emergency level with regard to agricultural products such as soya, coffee and fruit and vegetable farmers. One of the areas of research being pursued in the Laboratory for Animal Nutrition in the Center for Nuclear Energy in Agriculture (CENA), of the Luiz de Queiroz Agricultural College in the University of São Paulo, involves the standardization of Elisa kits for the detection and quantification of toxic residues in farming and livestock products. The Ministry of Agriculture's accreditation process, necessary in order to begin commercial production of the kits, requires the standardized methodologies to be validated. Given that CENA's laboratories are not adequate for international quality control systems ISO 17025 and BPL, a partnership has been signed with Ata Análise, which possesses the technical infrastructure and commercial experience necessary for the accomplishment of the project.

349 Innovation in the Production Process of Composts for Special Edible Mushrooms

Coordinator:
Denise Terezinha Barnabé Abackerli

Company:
Zucca Alimentos Ltda.

Approved value:
Phase 1: R$ 30,106

The consumption of edible mushrooms has been increasing throughout the world, whether because of its high culinary appeal, or its nutritional value, since it contains a high number of proteins and low or non-existent levels of fat. Mushroom production involves the creation of a favorable environment for their development (temperature, humidity, light, air) and a supplement of nutrient material (compost) to help it develop. For its production on a commercial scale, the combination of these factors should allow for the growth of the fungus to be controlled so as to synchronize market supply and demand, imposing additional conditions on the production time and cycle. Research carried out confirms the technical viability of the use of alternative materials in the production of compost and Brazil is a favorable place for these developments, given the abundance of alternative materials. However, the majority of studies limit themselves to concepts on laboratory scale. As a result, this project intends to develop the production process of composts for the (*Lentinus edodes*) and (*Pleurotus ostreatus*) shitake species, using alternative low cost materials available in the country. It is further proposed to test the compost with alternative materials for the *Oudemansiella canarii* (Ruegger, M.J.S. 2001) variety, native to Brazil, assessing in addition its commercial growth in the environment already developed for the cultivation of the hiratake.

350 Middleware for High Performance Electronic Games on Network

Coordinator:
Fábio Feital de Carvalho

Company:
Tempo Soluções em Informática S/C Ltda.

Approved value:
Phase 1: R$ 9,500 / US$ 1,490

Electronic games sell millions of copies world wide. To take advantage of these potential consumers, transforming a medium such as the videogame into a space for advertising is something simple, but there are two limiting factors: geographical locality and the time zone of the adverts. This project proposes a framework which, in addition to allowing developers to create network games almost as though they were stand-alone, also delivers the functionalities which the company calls "game-commerce": a virtual community which revolves around the movement of credits through the sale of games items or personalities and through the showing of adverts. Game-commerce solves the geographical and time location problems of commercials in games. The idea is to use the servers which manage competitions and handle the sale of items and personalities to exhibit the adverts also. The objectives of the project are: 1) To research a peer architecture for distributed entertainment systems (multiplayer games); 2) To study the technical viability of using the architecture with the hardware and network resources available on the market; 3) To create a methodology for the distribution of adverts in online games; 4) To implement a draft version of the framework; and 5) To create a game prototype to test the implemented functionalities.

351 Development of Continuous Production System for Torrefied Briquettes

Coordinator:
Félix Eliecer Fonseca Felfli

Company:
Bioware - Tecnologia de Termoconversão de Biomassa S/C Ltda.

Approved value:
Phase 1: R$ 48,172

This project aims to develop a production system for torrefied biomass briquettes by means of the inclusion of a continuous torrefier in traditional briquetage plants. The proposal is based on results obtained earlier, in which it was proved that torrefication is a procedure capable of improving the energy characteristics of biomass briquettes, preserving their main mechanical properties. A system of this type is capable of manufacturing highly standardized briquettes and with a high energy content, that's to say, a better quality product for industrial, commercial and domestic use with export potential. The objective of this phase of the project is to research the technical viability of the proposed system, envisaging three fundamental steps for this. The first concerns the study of biomass residues (raw materials) and efficient tech-

nologies for the production of briquettes more suitable for the torrefication process. In the second stage, torrefied briquette samples will be produced to characterize them and study their performance during their combustion in industrial, commercial and domestic ovens. In the third stage the most appropriate variants for continuous torrefication will be studied. As a result, it is hoped to obtain the preliminary design of a continuous torrefier, including the principal control mechanisms for temperature, transport and cooling of the torrefied briquettes.

352 Production of Polyclonal Antibodies

Coordinator:
Fernanda Alvarez Rojas

Company:
Imuny Biotechnology Produção e Comercialização de Anticorpos para Biotecnologia Ltda.

Approved value:
Phase 1: R$ 3,625 / US$ 15,400

Functionally antibodies can be characterized by their ability to recognize and bind with certain antigens which form antigenic determinants. Taking advantage of the physiological function of antibodies' humoral immunological defense, these antibodies, when produced in animal serum, can be used as important tools in some biological techniques for scientific research and in tests for diagnostic purposes. Polyclonal antibodies are very valuable in the techniques of immunoprecipitation, immunoblotting, immunohistochemistry and Elisa (enzyme-linked immunosorbent assay). The usual method for obtaining antibodies involves immunization with a preparation of pure or partially purified antigens. Thus, the present project aims to set up a laboratory for the development of the technology for the production of polyclonal antibodies for use in scientific research. It is also intended to make viable the production of these antibodies on a scale with commercial impact, with a substantial reduction in costs and acquisition time compared to those currently imported.

353 Generator of Systems for Business Processes Based on BPM (Business Process Management)

Coordinator:
Fernando Antonio Vanini

Company:
Klais Soluções Consultoria e Desenvolvimento Ltda.

Approved value:
Phase 2: R$ 109,825

The first objective of this project is to develop a platform for the automation of company processes based on the rules of business. The idea is that, even without software knowledge, a person may be able to create an internet-based system that will allow the users who carry out activities involved to interact in a differentiated manner, according to their roles in the workflow. The systems generated are based on Java and can be used on multiple platforms, including those based on freeware. Another objective is to offer a friendly interface, based on international standards defined by the Business Process Management Initiative (BPMI) for the description of company processes. In this way, the companies will be able to document them and redesign them easily, guaranteeing that the information technology tool keeps pace with the dynamic of the company processes and brings effective and long-lasting benefits to its management. The development of this product is based on a workflow administrator created by the company and now in commercial use. The new administrator, being based on open and already consolidated technology, should have a lower cost, which will place it within reach of smaller sized companies, giving them access to management concepts through processes which represent an effective way of gaining and retaining competitive advantage.

354 Concentrator of Fixed and Mobile Telephone Services - CFM

Coordinator:
George Emmanuel Bozinis

Company:
Innovatech Telecom Indústria e Comércio de Equipamentos Eletrônicos e de Telecomunicações

Approved value:
Phase 2: R$ 234,800 / US$ 17,575.76

This project aims at the development, in an innovative way, of a system for integration of the fixed and cell phone networks. Called Concentrator of Fixed and Mobile Telephone Services – CFM, the system consists of a low cost piece of equipment for the individual or corporate end user. The CFM allows the fi-

xed telephone and mobile phone user to access the fixed network from his own cell phone terminal if he is located within the area covered by the CFM, thus enjoying fixed network rates in those conditions. On leaving the area covered by the CFM, the user can access the mobile cell network in the normal way. The user's terminal camps in the CFM control channel if it is within the CFM catchment area. When the terminal moves away from CFM by means of the GSM reselect control channel, it will camp in the local operator's mobile system control channel. Thanks to this functionality, no additional development will be necessary at the mobile terminal, facilitating its implementation for the user and for the operating companies. CFM consists of a concentrator device which interconnects with the fixed network and has an aerial interface compatible with the GSM standard. The interconnection with the fixed network can be analogical, with line signal equivalent to that of the fixed line subscriber, allowing a single user to access this network at a particular moment; or digital, with an ADSL modem, allowing the multiplexing of the subscriber line by more than one user simultaneously.

355 Development of Kits for Immunodiagnosis of Canine Monocytic Ehrlichiosis, Using the Techniques of Indirect Immunofluorescence (RIFI) and Indirect Immunoenzymatic Tests (Dot-ELISA and ELISA-test)

Coordinator:
Gisele Maria de Andrade

Company:
IMUNODOT - Indústria e Pesquisa de Produtos para Diagnóstico Ltda.

Approved value:
Phase 1: R$ 39,693

Ehrlichia canis (*Anaplasmatacea*, *Rickettsiales*) is the etiological agent of canine monocytic ehrlichiosis, being an obligatory intracellular bacteria which infects monocytes and macrophages of the phagocytary monocytic system. *E. canis*, which has a worldwide distribution and causes high morbidity and mortality in endemic regions, is one among the extensively studied ehrlichiosis organisms. In the last two decades, ehrlichiosis organisms have been identified infecting human beings. The detection of *E. canis* antibodies can be carried out using the indirect immunofluorescence test (RIFI) and the indirect immunoenzymatic test (Dot-ELISA and ELISA-test), which are the object of this project. The precise diagnosis of canine monocytic ehrlichiosis is obtained from suitable clinical and laboratorial evaluations and its confirmation can be obtained with indirect sorological tests. In this project, a lineage of canine cells DH82 cultivated *in vitro* will be infected with a strain of *E. canis*, isolated by Machado (1993). From these cells antigenic substrates of *E. canis* will be prepared, aimed at the production of sorological tests. With this proposal the intention is to innovate in the area of veterinary medicine and, at the same time, to cater for a repressed demand which arises from external scientific dependence and the absence of biotechnological development.

356 System for Measuring Real Time for Swimmers

Coordinator:
Humberto Ribeiro de Souza

Company:
Mateus Rodrigues & Ribeiro de Souza Ltda.

Approved value:
Phase 2: R$ 61,065

The objective of this project is to develop a system capable of evaluating the performance of top swimming athletes. By means of wireless sensors optically linked to the side wall of the first lane of an Olympic swimming pool, a microcontroller measures the instant velocity of the swimmer on the basis of the distribution of sensors in the pool, and the speed which the athlete is achieving. The data calculated by the microcontroller is passed through a microcomputer which has a program which stores the data referring to the athlete and calculates the derivative of the acquired velocity, thus obtaining the exact position of the swimmer in the pool. With this information to hand, a qualified trainer can interpret the curves generated, checking the points of greatest attrition in the length, the swimmer's fluctuation and errors in specific activities such as turns. The system was evaluated on equipment developed with scientific test wire and software, displaying good results. With its technical viability and marketability proven by the company, phase 2 of the project aims to transform it into a commercial system. To do this, the interface needs to be practical, wireless and provide precise results. In addition to the internal market (swimming centers which train athletes for competitions at home and abroad), the

company also intends to launch the product on the international market.

357 Development of a Low Cost System for the Supply and Presentation in Various Media – Network, Internet, Palm, PDA, Cell Phone, etc. – of the Strategic and/or Performance Indicators of an Organization to its Executives and/or Owners of Processes

Coordinator:
João Antônio Mattei

Company:
Nacional Bureau de Serviços NBS Ltda.

Approved value:
Phase 1: R$ 34,400

The swift visualization of strategic indicators for decision making is one of the critical factors of organizations' success. The proposal of this project is to develop the functional specification for a system which is low cost, extremely easy to install, to use and to maintain and which enables the creation and visualization of strategic and/or performance indicators of organizations through various means of communication, promoting access to information any time anywhere. In other words, the aim is to develop a management control panel (Management Cockpit) for micro and small businesses, compatible with the predominant technology in that environment. The proposed specification should cover the following strategic aspects: 1) description of the standard-user profile which will serve as a reference point for the definition of the system's functionality and its installation and maintenance cost; 2) system model, bearing in mind a) principal sources of data which it will support for the formation of indicators; b) operational flow; c) treatment of deviations, case histories and warnings; d) means of visualization and compatible interfaces; e) scalability; f) technological environment required; and 3) script for interactive video for training in the installation, use and maintenance of the system; formation and configuration of the organization's strategic indicators.

358 Processor For the Detection of Oil Spills

Coordinator:
João Roberto Moreira Neto

Company:
Orbisat da Amazônia S/A - Divisão de Engenharia - São José dos Campos

Approved value:
Phase 2: R$ 318,400

Orbisat developed Brazil's first Interferometric Synthetic Aperture Radar, OrbiSAR-I, which operates on two different bands. Band X produces images of the surface and Band P has the capability of producing images of terrain under dense vegetation (forested areas). The processor for the detection of oil spills, proposed in this project, will be an OrbiSAR-I implementation. At present this radar records data obtained on hard disks and only at the end of the flight is it copied onto equipment that will process it. The project proposed here basically entails enabling OrbiSAR-I Radar to process raw data in real time, that's to say, as the data is gathered it could begin to be processed instantaneously during the flight. This represents an enormous technological innovation, given that commercial sensors capable of producing high resolution SAR images (in the order of 10 meters) in real time and at low cost do not exist. To do this, the hardware will need to be adapted by the replacement of two processing boards with other more modern boards in the Flight Computer Controller (FCC) unit; and the construction of the antenna with new parameters already defined, to be carried out by Orbisat in partnership with the State University of Campinas (Unicamp). The software will require the development of a real time processing algorithm.

359 Process for the Obtaining, Composition and Use of a System of Recombinant Hormones for Superovulation in Vertebrates

Coordinator:
Jorge Luiz Pesquero

Company:
Proteobrás - Desenvolvimento Biotecnológico Ltda.

Approved value:
Phase 1: R$ 75,000

The present proposal aims to establish in the city of Mogi das Cruzes a company specialized in the production of biotechnologies, specifically proteins for application in laboratories carrying out research, both in human health and in the veterinary field, with emphasis on the use of genetic recombination. It is inten-

ded, for this purpose, to establish a structure for the manipulation of genes of different animals. These genes should be introduced in specific vectors and these vectors inserted into genome cells or microorganisms which, in the process of fermentation, will proceed to express the respective gene, in this way producing the desired protein. It is also intended to establish the entire structure of the test of biological activity for these products and, in aseptic conditions, prepare for their use in animals and/or humans. The group has been working for years in this field, having produced proteins of high economic potential, for example: bovine and equine follicle-stimulating hormone (FSH), activin, inhibin and proteins homologous to angiostatins. Based on the angiostatin sequence, the group cloned and expressed a variety of this protein and proved its antitumoral effectiveness in experiments involving different animal species.

360 Development of Dental Ceramics Based on Alumina and Zirconia

Coordinator:
José D´Amico Neto

Company:
Tecnident Equipamentos Ortodônticos Ltda.

Approved value:
Phase 1: R$ 74,400

The orthodontics components sector has come on a pace in Brazil in the last ten years. It is estimated that this market turns over around US$ 100 million annually and, of this sum, 40 per cent represents the participation of Brazilian industry, which manufactures a very large range of once imported products. These include metal alloys, amalgams, components such as metal braces, cement and materials for the treatment of dental canals. However, the vast majority of ceramic-based products are still imported, such as ceramic braces, dental porcelains, ceramic enamels and various types of cement and molds for precision dental casting. The objective of this project is the development of alumina and zirconia based ceramic braces. Alumina is proposed as the base ceramic to be used in the production of colored components, much sought after in dental surgeries by children and adolescents who undergo treatment for orthodontic correction; and zirconia, as a base for the production of components with colorations which approximate to the different natural tones of teeth. In order to achieve this, studies will be undertaken on the synthesis of alumina-based and zirconia-based mixtures containing different quantities of dopants capable of coloring the molds of both.

361 Single Dose Vaccine Against Bovine Tick

Coordinator:
José Maciel Rodrigues Junior

Company:
Nanocore Biotecnologia Ltda.

Approved value:
Phase 1: R$ 99,840

Economic losses caused by ticks are difficult to evaluate, but it is estimated that in Brazil they reach a figure of US$ 1 billion, taking into account the loss of production of milk, meat and leather, mortality, the reduction in birthrate and the consumption of anti-tick insecticides, among others. The existing recombinant vaccines against the *Boophilus microplus* tick are imported and give a level of protection which varies between 50 and 70 per cent, but several application doses are needed, which raises the cost of administration. Due to this, researchers from Nanocore, in partnership with the Cuban Center for Biotechnology, holders of the commercial rights to the Gavac vaccine, developed two products which were patented and are in the optimization and pre-clinical evaluation phase. The first of these is an annual single-dose formulation and the second is an annual single-dose formulation associated with antiparasitics of a broad spectrum and wide use. This project aims to develop the large scale production of microspheres containing a recombinant protein, Bm86, associated with active broad spectrum immuno-enhancing drugs against ectoparasites, capable of providing a more effective response and offering greater facility in the management of animals. The advantage of an offer such as this should, above all, take into account the profile of the technology platform, since it should be possible to obtain different medicines and vaccines to meet the diversified demand for products of this nature.

362 Generation of Graphical Interfaces for Parallel Real Time Applications Based on Source Code

Coordinator:
José Roberto Pinto Ribeiro

Company:
Eonic Brasil Ltda.

Approved value:
Phase 2: R$ 20,400

The reduction in the cost of processors and the emergence of faster networks to connect them has enabled the construction of powerful parallel systems, capable of supporting applications which handle large volumes of data and demand high processing capacity. These systems have been used in an increasingly large number of areas, but, despite this, parallel programming has proved to be much more complex than sequential programming, mainly because it involves the need for synchronization between processes and the analysis of data dependence. To overcome this difficulty, Eonic Brasil created a graphical environment called VisualRT, the objective of which is to assist in the development, documentation and visualization of real time applications run on parallel machines. With this tool, the user develops a graphical model of the real time system capable of representing the parallelism and the temporal restrictions present in these systems. Based on this model, VisualRT automatically generates source code, builds the executable files and runs the application. Although VisualRT offers a high level interface for the management of parallel real time systems, the consumer market for the tool is composed mainly of companies that still have a significant quantity of applications developed through textual interfaces. So that these companies can have access to the advantages offered by VisualRT for the maintenance of their systems, they need an effective system to map out the textual interfaces in the equivalent graphical representation. The objective of the present proposal is the creation of a piece of software to automate this mapping. It should produce graphical representations of parallel real time systems based on the source code of these systems, freeing the user from the task of carrying out the conversion manually.

363 Mini-Washing Machine

Coordinator
Marcelo Monteiro

Company:
Santos Dumont Criação e Design Ltda.

Approved value:
Phase 2: R$ 196,331.92

This project proposes a new concept for washing machines. The company researched and compared the main systems (tumbling and agitating) and extracted information which served as the parameters for the idealization and conception of a product without equal on the market. The mini-washing machine will have a wash capacity of 3.5 kilos of clothes, in addition to being an economic, practical, efficient and modern product. The mini-washing machine, the prototype of which is in the test phase, reduces by around 40 per cent the dimensions and weight of the current 5 kg machines, and for this reason it optimizes valuable resources such as water, electrical energy and space. One of the most important innovations is the new electric motor, which should be attached to the lid. In this way, many of the mechanical components needed for the movement of the wash tank, such as driving belt, pulley, gears and gear shift are done away with. The consumer will be able to buy a mini-washing machine in any supermarket and transport it easily. In addition, the simplicity of its construction reduces the cost of production significantly.

364 Provision of Dental Accessory

Coordinator:
Miriam Nakatani Miqui

Company:
DDS Produtos Odontológicos Ltda.

Approved value:
Phase 1: R$ 69,200

Nowadays, the traditional orthodontic brace with 0.18 and 0.22 slots has various limitations. The slot, in combination with the wires, determines the strength. A 0.18 brace will take a wire of 0.18 height and 0.25 depth, and the 0.22 support will take a wire of 0.22 height and 0.25 depth. Depending on the phase, there are different techniques which use different diameters for certain modifications, always limited to the size of the slot. This project aims to facilitate the use of the 0.18 and 0.22 wires, developing a brace capable of working with both. The traditional brace has 16 brackets in contact with the soft tissue of the mouth, while the brace planned by the company will have just four brackets, which will provide four times the level of comfort. Besides this, the traditional brace that will be developed will eliminate the need for elastics or wire ligatures to be tied to the arch wire due to a new clip system which decreases the accumulation of plaque and the risk of tooth or mouth disease. Initially, it will be necessary to identify the best material for the manufacture of the product, which will be developed with milling techniques to guarantee greater precision

and flexibility in the manufacturing process. This technique, however, does not appear so efficient when used for mass production. Thus, in the second stage of the research, mill rolling techniques will be used to guarantee productivity and economic viability.

365 Optimization of Production Process for Large Scale Gain in the Micropropagation of Plants

Coordinator:
Monique Inês Segeren

Company:
ProClone Biotecnologia Ltda.

Approved value:
Phase 1: R$ 69,000

In order to have access to the international flower and fruit markets, which turn over around US$ 86 billion in the entire world, it is necessary to pay close attention not only to quality, but also to productivity, which is the other competitive determinant in external markets. In order to do this, it is important to incorporate in the production process all the technology-based knowledge available in the national academic environment. Within the sterilization process, productivity is determined by the speed of filling the pots with medium, by the volume of medium sterilized per cycle, by its cost, by the reliability of the sterilization process, by the amount of man-hours involved, by the training of this manpower and by the quality of the sterilizing machine. Of these, the fundamental factors are the quality of the sterilizing machine and the reliability of the sterilization process (absence of fungi and bacteria in the medium), in addition to the volume of production, in case of large orders. This proposal aims to study the viability of building a medium sterilization machine with plasma in replacement for the autoclaving process. The equipment should use less electrical energy and, due to its automation, use less specialized manpower, sterilizing according to the rate of consumption (just-in-time system) and not in large pre-determined volumes.

366 Development of High Performance Laminated Armor Materials Composed of Alumina Ceramic and Fiber Fabric for Personal and Vehicular Ballistic Protection to NIJ Ballistic Levels III and IV

Coordinator:
Ricardo Guimarães Morrone

Company:
Gepco Indústria e Comércio Ltda.

Approved value:
Phase 1: R$ 62,616 / US$ 3,900

The objective of this project is to develop a line of high performance products for personal and vehicular protection, using a system of laminated materials consisting of ceramic (alumina) on the impact side and with a high-performance fiber covering for the backing material. The use of ceramics for ballistic protection began in the 1960s, but what little information was available in the literature did not demonstrate how to prepare a product with high performance and which had a price favorable to commercialization. Phase 1 of this project involves: 1) ceramic level: commercial ceramic products made from alumina will be tested in the form of six-sided tiles, in sheets and samples will systematically be prepared with different purities and microstructures; 2) level of fiber backing material: different types of commercial fiber with high ballistic performance will be tested, with the proposed innovation of testing the efficiency of the use of mixtures of layers of different fibers; and 3) adhesive level: different polymeric adhesives will be tested, which implies the optimization of the lamination process in the autoclave. The second phase of the work will involve the design and development of the products, that's to say, the optimization in terms of materials and geometry.

367 Study of the Technical Viability of the Use in Yoghurt of Natural Beetroot Coloring Obtained by Alcoholic Precipitation (a New Methodology of Production)

Coordinator:
Rogério Côrte Sassonia

Company:
Clarear Consultoria para Indústria Alimentícia S/C Ltda.

Approved value:
Phase 1: R$ 37,100

In this project it is intended to study the technical viability of the application, in yoghurt, of beetroot coloring obtained by alcoholic precipitation. The main advantage of this process, when compared to other technologies, is the greater concentration of betanine in the product. Betanine is the substance

responsible for the tinctorial power of the coloring, capable of replacing with considerable advantage the commercial beetroot colorings currently on the market. In addition, this substance has great potential to replace synthetic colorings, which have been the subject of successive restrictions at home and abroad. Among applications of beetroot coloring, recent studies (J. Agric. Food Chem., 2003) show that betanine displays good stability in the production and storage conditions of yoghurt, that is, pH between 4 and 5 and storage temperature of 40ºC. Furthermore, amongst the products of fermented milk, yoghurt is without doubt the most widely consumed. To make viable the application of this coloring in the yoghurt manufacturing process, it must be confirmed that it does not compromise the fermentation process nor the viability of the lactic microorganisms during their useful life. The color of the product must remain stable during the storage period and, besides this, the addition of the coloring should not compromise its taste. Complementary analyses will have to be undertaken to confirm the quality standards established by the Adolfo Lutz Institute, as well as to determine the sugar composition with a view, also, to its application in dietetic products.

368 Software for the Strategic Management of Knowledge

Coordinator:
Valter Francisco Arruda Alves

Company:
Invenire Internacional Informática S/C Ltda.

Approved value:
Phase 1: R$ 63,825

The objective of this project is to demonstrate the viability of producing a piece of software for the strategic management of knowledge within an educational and entrepreneurial philosophy. There are on the market costly software programs used in the management of knowledge centered on information technology, on management information systems, or on the creation of corporate portals. None of these products takes as its starting point company strategies and the knowledge conversion process, that is, the creation, the codification, the storing, the diffusion and the application of knowledge. The software proposed here could be characterized as a learning resource. This product will make available, in the form of templates, conceptual maps, texts and case studies: 1) models for strategic management, such as analysis of scenarios and identification of organizational strengths and weaknesses; 2) processes of converting knowledge from tacit to explicit (and vice-versa), such as socialization, externalization, internationalization and combination; and 3) stages in the learning process, such as concrete experience, reflection on what has been lived through, the shaping of concepts and the application of what is learned to new situations, taking as reference the model developed by David Kolb. These business processes and learning models will be integrated in a practical form and in language accessible to the users.

18th BIDDING INSTRUCTIONS

369 Machine for Polishing Fiber Optic Connectors

Coordinator:
Benjamin Grossman

Company:
Cromática Sistemas de Comunicação de Dados e Informática Ltda.

Approved value:
Phase 1: R$ 22,400

On the international market there are some manufacturers of machines for polishing fiber optic connectors. These items of equipment, which typically polish from 6 to 12 connectors simultaneously, are extremely expensive as they are based on a very precise mechanical construction. In these machines, the polishing film rests on a platen which moves in the form of a figure eight or planetary figure (for the combination of the two movements). In the project proposed here, the objective is to develop a new type of machine, extremely compact, the platform of which will execute a random vibratory movement, similar to Brownian movement, although in macroscopic amplitudes. Proceeding in this manner, the optimal characteristics of the fiber connectors are achieved naturally, without the need for precision in the mechanical make-up of the parts. As far as is known, this idea is unique and the machine should be the object of an international patent. Depending on the results to be achieved, this same proposal could, eventually, be extended in three dimensions, simulating a Brownian agitator aimed at homogenizing mixtures for application in the chemical, pharmaceutical or biological business.

370 Integrated Telemetric and Telecommand Solution Based on Wireless Technology for Refinement to Urban Services

Coordinator:
Antonio da Silva Jucá Junior

Company:
Gwyddion Indústria de Produtos Eletrônicos Ltda.

Approved value:
Phase 1: R$ 61,948

Advances in embedded computer technology have brought about the technical and economic viability of the spread of microprocessed control systems, which today constitute a common resource in all kinds of electronic equipment. The inclusion of communications facilities in these devices enables remote access to their functions, creating conditions for the implementation of telemetric and telecommand systems. Amongst the benefits sought, are the reduction in operating costs and the improvement of the quality of service by means of online monitoring, an increase in efficiency in the use of shared resources, better integration with management systems and decision support, refinement to security and new applications enabled through inter-device interaction. Focusing on the potential of this technology, this project aims to put into action a research plan aimed at setting up an integrated telemetric and telecommand system based on wireless communication via the mobile phone network. Exploring the most up-to-date telecommunications and internet technologies, the mechanism was conceived to operate on the standard GSM cell channel, using the GPRS protocol (GPRS is designed for applications which require telemetric and telecommand systems with mobility and reliable continuous flow of information). The applications envisaged include sectors such as public services, logistical control, patrimonial security, domestic billing, environmental monitoring and the telemaintenance of equipment.

371 Development of an Identification System for the Rice Finch (Oryzoborus angolensis) Using DNA Microsatellites

Coordinator:
Antonio Francisco Ferreira Neto

Company:
Unigen Tecnologia do DNA Ltda.

Approved value:
Phase 1: R$ 66,808

For the beauty of its song, the wild rice finch (*Oryzoborus angolensis*) is the bird which enjoys the best organized breeding in captivity in Brazil. The rice finch appears on the list of the Brazilian Institute for the Environment and of Renewable Natural Resources (Ibama) as one of the species commonly confiscated in the traffic of wild animals throughout Brazil. The activities of passerine breeders from Brazilian wild fauna are coordinated by Ibama, which recently developed a computerized system, Sispass, for the registration of breeders and birds. Since 2001, 74 thousand breeders have already been registered and almost 1.3 million birds, the majority rice finches (245,085 birds registered). Sispass relies heavily on the truthfulness of the information supplied, frauds being therefore a possibility. The proposal of this project is to develop a system of genotyping of micro-satellites of the rice finch, suitable for the computerized registration of the birds and the automatic parental determination (certification of origin). The project could also cater for the recently created Consortium for the Export of Native Brazilian Birds, established by the National Cooperative of Native Bird Breeders (Cocpan) and the Brazilian Service in Support of Micro and Small Businesses (Sebrae), which relies on proof of guarantee of the origin of birds for the purposes of certification and to be able to place the rice finch on the international market, which would lead to the promotion of a new sector in the national economy. The system could be adapted for various species of the *Emberizidae* family, also bred in captivity, and, in some cases, threatened with extinction.

372 Planning Tool for Broadband Data Transmission Systems Via the Electricity Network Infrastructure

Coordinator:
Carlos Alberto Fróes Lima

Company:
KNBS - Telecomunicações e Informática Ltda.

Approved value:
Phase 1: R$ 7,000

This project aims to develop a tool for planning broadband data transmission systems via the electricity network infrastructure, using Power Line Communication (PLC) technology. This tool should per-

mit the design of broadband systems, from the so-called last inch (internal network in the user's environment), passing through the first or last mile, up to the backbone operator. The software tool to be developed will be integrated with a relational database and to a georeferenced tool for the planning of access networks to broadband internet. In phase 1 of this project, focused on the preliminary study and in the setting up of the system, there will be a need to analyze, among other things: the parameters of the signal-noise relationship, interference, bandwidth frequencies, transmission power and signal attenuation along the distribution lines in accordance with the topology. The noise characteristics of low and medium voltage distribution lines and their influence on the performance of PLC system will be evaluated. The system's architecture will be totally object-oriented and the development environment will preferably be based on the use of open source software. PLC technology could help in meeting the challenges of broadband internet access in Brazil, including the inclusion of disadvantaged layers of society by means of the provision of services in areas and segments as yet uncatered for by networks and telecommunications services.

373 Vitroceramics for Use in Electric Oven Plates

Coordinator:
Catia Fredericci

Company:
Vitrovita Instituto de Inovação em Vitrocerâmicos

Approved value:
Phase 1: R$ 38,896 / US$ 9,970
Phase 2: R$102,310 / US$ 104,145.33

The production of vitroceramics (VC) is very limited to traditional techniques of fusion, conformation, nucleation (induced by the addition of catalyzers) followed by the growth of crystals in the volume of monolithic glass components. An alternative route for the production of vitroceramics is sinterization with controlled crystallization. In this case, there is no need to add nucleation agents to the glass, given that particles of impurities and defects present in the very surface of the vitreous particles carry out the function of nucleation agent. The sinterization should occur at the start of the process and only at the end should the crystallization be commenced. These materials are useful in countless applications, such as in the surface of modern electric ovens, which have no flame, merely circles (heated by electricity or infrared) on which saucepans or the food itself is placed. These plates have enormous esthetic appeal and are easy to clean with a damp cloth. In this work, it is proposed to develop, for use in electric ovens, VC plates obtained through the glass sinterization method which develops crystalline phases with a low coefficient of thermic expansion. Extensive searches of national and international patent records were carried out, but failed to uncover any vitroceramic with applications in ovens with the characteristics described.

374 Manufacture of Hospital Washing Machines and Consultancy to Hospital Laundries

Coordinator:
Choyu Otani

Company:
Ecowash Ind. de Máquinas e Lavar Roupas e Serviços Ltda.

Approved value:
Phase 2: R$ 247,397 / US$ 16,585

The aim of this proposal is to extend and deepen the knowledge acquired in the previous project financed by FAPESP, entitled Development of a High Performance Ozone Generator. During its implementation, good results were obtained with the use of ozone in the process of washing hospital linen. The current project aims to harness the necessary scientific and technological support in order to endorse the process of the ozone-assisted laundering of hospital linen, thus opening the way to achieving the most relevant specific objective, which is the building and ratification of a new washing machine, called the EW 100, which will be integrated with an ozone generator. To be able to achieve these objectives, the company's researchers and technicians will pool the necessary multidisciplinary knowledge and experience for: 1) production of ozone generators; 2) production of hospital washing machines; and 3) Development of innovations in hospital laundry processes. Both the process and the machine should incorporate technological innovations.

375 Therapeutic Vaccine for Equine Melanoma

Coordinator:
Cristina de Oliveira Massoco

Company:
Oncocell Biotecnologia Ltda.

Approved value:
Phase 1: R$ 44,919 / US$ 7,161.11

According to the Brazilian Institute of Geography and Statistics (IBGE), the equine population in Brazil is around 6 million, of which it is estimated that between 180 and 480 thousand suffer from melanoma, which leads to a considerable economic and genetic loss in the farming market. Melanoma is particularly common in horses with dapple-gray pelage, after the age of five. Current treatments are based on the application of chemotherapies, immunomodulators and/or surgical resections which present a high level of toxicity, iatrogeny and low effectiveness. The use of hybrid dendritic-tumor cell vaccines in human patients carrying melanoma and carcinoma of the renal cells showed promising results. In view of this, the present project aims to verify the efficiency of the same methods for equine tumors. The effectiveness of the use of a variant of immunotherapy which will use hybrid cells generated by the fusion *in vivo* of tumor cells with differentiated equine dendritic cells will be analyzed. This project intends to use, in an unprecedented manner, the dendritic cells drawn from the equine peritoneal cavity in the preparation of an anti-tumor vaccine. If the attempt is successful, it will have produced an efficient therapy for equine melanoma and a new way of producing dendritic cells.

376 Re-engineering of Large Scale Legacy Systems Based on Frameworks, Distributed Components and Design Standards

Coordinator:
Edimilson Ricardo Azevedo Novais

Company:
Transformare Evolução Tecnológica de Sistemas Ltda.

Approved value:
Phase 2: R$ 126,000

This research project offers an approach to technological evolution to rebuild legacy systems with recurring bases and on a large scale, aiming to meet the growing demand from businesses and governments that need to upgrade their software and hardware platforms. This approach was structured on a robust software architecture base consisting of distributed components, design standards and frameworks. The defined architecture allows for the technological evolution of the rebuilt systems, since it improves the quality of the code, makes future maintenance easier and permits the running of these systems on heterogeneous, distributed and open platforms. The Catalysis method is used in the development of the components; the principal mechanisms for executing this approach are a transformation system, a support tool for reverse engineering and a Case tool.

377 Microcamera Attached to Frontal Surgical Illuminator

Coordinator:
Edson Minoru Kubo

Company:
Foco do Brasil Indústria e Comércio de Aparelhos Científicos Ltda.

Approved value:
Phase 2: R$ 180,255 / US$ 9,285.25

The objective of the project is to develop a microcamera attached to a frontal surgical illuminator, the principal applications for which are aimed at technical-surgical specialties and skills: heart surgery, neuro- and plastic surgery, among others. The visual capture could even be used for the demonstration of new techniques in scientific meetings; as a teaching tool in medicine and biology; for the live demonstration of procedures and anatomy classes. The illuminator proposed here is without equal, offering superior technological innovations such as the complete elimination of parallax errors between the optical illumination system and the microcamera. In the first phase of the project, two prototypes were manufactured. Phase 2 aims to make the technique developed even more sophisticated, to define the production process in accordance with regulatory norms and to significantly reduce production costs. As far as commercialization is concerned, the dimensions of the Brazilian market are quite respectable. There are 45,500 surgeons with technical skills and specialties, and other potential dimensions. The exploitation of specific niches and the launching of models with better technical resources and incorporating new technological functions lifts the product into a context in which expectations are very promising. It is estimated that the price of the equipment will be 50 per cent lower than imported equivalents.

378 Sinterized Vitroceramics for Ceramic Claddings

Coordinator:
Eduardo Belllini Ferreira

Company:
Vitrovita Instituto de Inovação em Vitrocerâmicos

Approved value:
Phase 1: R$ 62,750 / US$ 1,350

Sinterized vitroceramics for ceramic claddings with a high esthetic appeal are commercially manufactured by a single company in the world, the Japanese firm Nippon Electric Glass (NEG). The main commercial vitroceramic product for cladding is composed of the pseudo-wollastonita crystalline phase, an acclaimed success, but of restricted use owing to the high price. Currently we are witnessing a wild international chase after new compositions of sinterized vitroceramic with a more accessible price, with impact equivalent to that of porcelained gres, in applications such as floor and wall claddings, in addition to many others. The intention of this project is to develop a material for use in ceramic claddings obtained by the sinterization and crystallization of glass particle compacts. Its main phase should differ from that used by NEG, namely, a complex pyroxene of calcium, magnesium, silicon and aluminum, which displays promising properties for the applications mentioned, such as extreme hardness, resistance to abrasions and chemical resistance. Despite the technological advance in processes for the manufacture of sinterized vitroceramics, the technique is still far from saturation and is open to alternative processes and formulations.

379 Synthesis and Production of Poly (L-lactic acid-co-D,L-lactic acid) Implant Materials

Coordinator:
Eliana Aparecida de Rezende Duek

Company:
Engimplan - Engenharia de Implantes Indústria e Comércio

Approved value:
Phase 1: R$ 59,047 / US$ 2,400

Since 1960, studies have been carried out to assess the feasibility of various bioabsorbable polymers for use in surgical implants. The studies indicate principally homopolymers and copolymers such as, poly (L-lactic acid), PLLA, poly(glycolic acid) PGA, polycaprolactone, PCL, poly(p-dioxanone), PDS. The results obtained facilitated the introduction of various absorbable devices on the market, the first of which was sutures. Later, advances permitted the commercialization of polymers with sufficient resistance for orthopedic applications. Nowadays, the greatest interest is focused on the synthesis of the copolymer of L-lactic acid and of D,L lactic acid, generating a completely amorphous and more flexible polymer which can be shaped by means of a hot bath at the time of the implant, according to the patient's anatomy. The aim of this project is to synthesize the copolymer PL-DLA, poly(L-lactic acid-co-D,L-lactic acid). In order to do this, phase 1 of the project involves two stages. The first involves the synthesis and characterization of the copolymer; and the second stage involves pilot tests of processing the polymer in the form of sheets and screws. Since the devices existing on the market today are imported, which restricts their consumption, it is hoped with this development to extend the use of surgical implants to broader layers of the population.

380 Econometric Modeling Project for the Broadening of Knowledge of the Brazilian Geoinformation Market

Coordinator:
Gilberto Câmara Neto

Company:
Geoconsult Ltda.

Approved value:
Phase 1: R$ 11,132 / US$ 4,150

This project aims to carry out the econometric modeling of the geoinformation sector in Brazil and develop a sectoral index to assist in the tracking of dynamics in this market. To support the creation of this growth indicator, it is intended to implement an application for the exchange of metadata on geographical information. Based on open source software, the application will permit the dissemination via internet, of the location of georeferenced data bases, their origins and main characteristics, the identity of their respective owners or patent holders for all the available products, freely available or subject to commercial conditions, across the national territory. In phase 1, the proposal is to outline the methodology for a market research, as well as the way in which the data obtained will be tabulated for use in

econometric models. It is also intended to describe the design for the application for the exchange of geographical information and the competitive intelligence system contained within the scope of this project. In addition, still within this phase, in a business plan, commercial approaches will be outlined, based on suitable strategies for the information assets.

381 GP-101

Coordinator:
Guido Fontegalante Pessotti

Company:
GP Aeroespace Ltda.

Approved value:
Phase 1: R$ 51,800

The project will study the viability and proof of concept for the development of a family of advanced, low cost and high performance aircraft, both manned and unmanned. These aircraft should be used in several sectors. In agriculture for the spraying of defensives necessary for the maintenance and optimization of crops, mainly grain and sugar cane; in transport, designed for distances above 1600 km and a velocity of 300 km/h; in the training of pilots; and in other paramilitary applications such as security and patrolling. The equipment should have considerable efficiency, economy and innovatory differentials compared with existing aircraft. The plane will incorporate the most advanced aerospace technology and its nationalization index will be practically total. With this logistics, the idea is to position Brazil as the largest global manufacturer of advanced and multifunctional ultralights, as well as to initiate advanced studies for the pioneering production, in Latin America, of Unmanned Aerial Vehicles (UAVs).

382 Development of a Telephone Terminal with Compensation for Hearing Deficiencies

Coordinator:
Guido Stolfi

Company:
Koller e Sindicic Importação e Exportação Ltda.

Approved value:
Phase 1: R$ 51,000

This project aims to develop a prototype telephone receiver aimed at individuals who suffer from light to moderate hearing deficits. This device should incorporate the means of digitally processing the voice signal received, in order to improve its intelligibility. The equipment should allow the user to control the application of the processing resources so as to adjust the result to the individual characteristics of his auditive perception. In this equipment it is proposed to use signal processing algorithms which are innovative compared to those usually found in conventional auditive prostheses, or even in ordinary amplified telephones; and which should be particularly suited to the characteristics of the telephone channel, such as: filtering with continuously adjustable cut-off frequency, selective compression of the dynamic range, spectral replication and translation. The evaluation of the effectiveness of the implemented processes with regard to intelligibility will be carried out by means of recognition tests of isolated syllables and sentences applied on representative groups of different classes of hearing deficit.

383 Development of a New System of Multichannel Acquisition for Pulmonary Monitor Based on Electrical Impedance Tomography

Coordinator:
Harki Tanaka

Company:
Timpel S/A

Approved value:
Phase 2: R$ 299,611.07

Over the last ten years various lines of research have been developed in the use of electrical impedance tomography (EIT) as a non-invasive piece of equipment for obtaining images of the human body recorded by electric current instead of X-rays. However, to-date there is no equipment approved for use with patients for the monitoring of mechanically ventilated lungs. This type of use is a new idea, still in the research and development phase, in Brazil as well as abroad. A EIT prototype was set up in 2003, as part of a thematic project financed by FAPESP, with components existing on the market - many of them imported and expensive. It is necessary for this prototype to evolve to the point of obtaining a better quality image, adaptation for use with human beings and for large scale industrialization. To do this, a new system of signal acquisition and pre-processing for the measurement of bioim-

pedance called Multichannel Acquisition System (MAS) will need to be developed. This system will permit an increase in the speed of image generation and quality, the miniaturization of the interface with the patient and a decrease in the cost of the apparatus. This entails a decisive step in the adaptation of the EIT at the bedside, as well as its financial viability, making its costs competitive.

384 Recycling of Plastic Bottles at Gas Stations and the Like

Coordinator:
Ivan da Cruz

Company:
Compacto Ind. Com. Reciclagem Plástica - ME

Approved value:
Phase 1: R$ 18,527

Gas stations discard into the environment plastic bottles of high density polyethylene (PEAD) contaminated with lubricant oil and additives used in the maintenance of motor vehicles. Since the biodegradable time span of PEAD is very long (over 100 years), these bottles reduce the useful life span of rubbish dumps and landfills. The residual oil contained in the bottles causes soil pollution, as well as complicating the recycling process. Recyclers are discouraged from processing these bottles because there is no available decontamination procedure. Based on these precedents, the present project aims to study and develop recovery and recycling processes for lubricating oil, additives and PEAD, originating in the leftover bottles in gas stations. The project has the relevant techniques for the creation of a piece of equipment called the Chemical Decontamination Phase, which is already in the secrecy phase with the National Institute for Industrial Patents (INPI). This equipment should carry out the extraction/separation of the lubricating oil contained in the plastic bottles, which subsequently will go on to be refined. The final stage will result in a viable global program to return these residual pollutants to useful life, with extremely positive gains in environmental, economic and social gains.

385 Pharmacology, Toxicology and Chemistry of the Oil Extracted from Fatty Bodies of the Rana catesbeiana (Shaw)

Coordinator:
Jayme Antônio Aboin Sertié

Company:
Central Brasileira de Comercialização e Distribuição de Rã Ltda.

Approved value:
Phase 1: R$ 47,545.73

The popular use of the oil extracted from the fatty body of the *Rana catesbeiana Shaw* frog has increased, above all as an anti-inflammatory anti-ulcerant gastro-duodenal cicatrizant. These bodies, the oil of which is very simple to extract, are a waste material in abattoirs, therefore their cost is zero. The incidence of the pathologies mentioned has grown at an average 10 per cent a year and, amongst the most widely sold medicines to combat them, anti-inflammatory anti-ulcerants account for 31 per cent of the world market. In addition to being expensive, the available medicines have some limitations in clinical use and certain precautions need to be exercised in their administration. Since the scientific literature makes no reference to studies in this area, the present project proposes to carry out a pharmacological, toxicological, and chemical screening, involving the evaluation of the anti-inflammatory activity of the oil from that *Rana catesbeiana Shaw* frog species applied topically and administered orally. The data obtained will be compared to that of standard drugs in four experimental models, two severe and two sub-chronic, determining the dose-effect relationship and calculating the effective dose. It is also intended to evaluate the anti gastric ulcer effect, compared to standard drugs, in two rigorous experimental models, determining the index of lesions, the parameters of gastric secretion and the establishment of the effective dose, amongst various other activities. The project also includes, at the end of this phase, the chemical-analytical characterization and standardization of the initial sample to be evaluated.

386 Applied Oceanic Monitoring System

Coordinator :
José Edson Rodrigues Pereira

Company:
Applied Science Consultoria Ltda.

Approved value:
Phase 1: R$ 12,000

The company has formed a partnerships with the Laboratory for Oceanic Numeric Modeling of the University of São Paulo's Oceanographic Institute

with the objective of meeting the requests of Petrobras for the development of oceanic current diagnoses and studies of the impact of petroleum accidents in 21 of its terminals. From this association emerged the basic tools and ideas behind the present project, which entails the development of a management system for the prediction of the drift of oil slicks, combining mathematical sophistication, practicality and reliability of results for use in the case of accident in a particular oceanic region. This system seeks to coordinate, in an optimized manner, hydrodynamic models of known formulation and applicability in the academic environment and models developed specifically for studies of dispersion of oil, of chemical products, of the transport of sediment and of water quality. The technological innovations of this project should appear in small and multiple routines which enable the setting up of a structure for automated environmental monitoring, providing quick responses in complex oceanic environments, in terms of situational diagnosis and outlook. Implemented in a specific region, this system should be capable of handling the management of observational data, meteorological forecasts and oceanic norms in different scales and resolutions.

387 Development of a piece of Software for Pairing and Integration of Personal and Health Information, Using Record Linkage Method and HL-7 Standardization

Coordinator:
José Augusto Vasconcellos Neto

Company:
IPS - Informação e Planejamento em Saúde Assessoria e Comércio Ltda.

Approved value:
Phase 1: R$ 18,300

The aim of this project is the construction of a system which administers customer subscription records, establishing a correlation (or pairing) between two or more subscriptions of the same person using record linkage techniques. The correlated subscriptions may originate in the same or different databases. In addition to this, the system integrates the health information originating in the different data bases using the HL7 protocol. Thus, the project is based on two technologies (record linkage and HL7) which, although not exactly new, are to a certain extent still experimental and not very well known in Brazil. The innovative aspects of this project are: 1) the use of record linkage to establish a permanent master patient index; 2) the joint use of the two technologies; 3) the adaptation of these technologies to the Brazilian reality; 4) the use of methodological innovations such as nebulous logic and graph theory in record linkage; and 5) research into a robust and scalable architecture capable of processing all the databases in the Ministry of Health (a few terabytes). The planning for phase 1 of the project includes, among other activities, concluding the specification of the system modules; specification of the principal algorithms; specification of the data storage; the implementation of a complete prototype with all the modules.

388 Development of a Support System for the Integrated Management of Pay-as-you-Fish businesses in the Central Region of the State of São Paulo – Fishing Project

Coordinator:
José Galizia Tundisi

Company:
Instituto Internacional de Ecologia São Carlos Ltda.

Approved value:
Phase 1: R$ 58,715

The global aim of this project is to develop and apply a new methodology of diagnostics and improvements for fishing enterprises in the central region of the state of São Paulo. The methodology centers on the quality of the water where aquaculture is practiced and in the socio-environmental improvement of the amenities and the whole operational system of the fishing grounds. It is intended to achieve this aim by making available a digital data base, giving direct guidance on the implementation of necessary environmental improvements for bringing the enterprise up to standard. A piece of software will be developed containing the self-diagnosis methodology and a roadmap for the implementation of the necessary environmental improvements. The aim is for the broad commercialization of this product with competitive gains for the company and the exploitation of the activity within high quality parameters. It is also intended to assemble kits for analyzing the water quality which should be available to the fish farmers and be used by their own employees, following training. It is planned to train a large number of disseminating agents and instructors so that they can do the training of technical and administrative personnel,

so as to provide continuity to the improvements and watch over the evolution of the environmental management systems developed in the fishing grounds.

389 Precision System for the Localized Variable Rate Limestone Application

Coordinator:
Luiz Antonio Balastreire

Company:
Enalta Inovações Tecnológicas para Agricultura

Approved value:
Phase 1: R$ 76,789

Agricultural correctives are fundamental inputs in farming. The efficiency of the production process depends on the quality of these inputs and the way in which they are applied to the soil. When there are failures in their use, this stage is compromised, creating results which directly affect agricultural productivity. Creative and innovative solutions in this area have been the subject of research into the development of new products, owing to the demands for a reduction in costs, a decrease in environmental contamination and an increase in the efficiency in the application of correctives and fertilizers. The project proposed here aims to meet the needs of the farming market by means of the development of an innovative system geared towards the localized application of correctives. This system will be integrated to work in inhospitable field conditions and to be operationally viable within the dynamism of the activities encountered, so as to establish a new management concept in this sector. Basically, the system will consist of an item of equipment for the distribution of correctives and fertilizers, through a central processing and data collection module, through a CAN scan and specific geographical information software for precision agriculture.

390 Development of a Methodology Applicable for the Production of Cationic Latex from Natural Rubber on a Commercial Scale

Coordinator:
Márcia Maria Rippel

Company:
Prolatex Comércio de Latex Ltda. (ex-Estância Santa Terezinha)

Approved value:
Phase 1: R$ 61,600

Natural rubber latex obtained from the tapping of trees is anionic by nature, being traditionally used in this form for the production of gloves, condoms, adhesives and foams, among other materials. The stability of latex is short, due to the action of microorganisms which reduce the pH, destabilizing it and promoting its spontaneous coagulation. Therefore, the addition of preservatives such as ammonia is necessary to increase its stability and permit its use in the form of aqueous dispersion. Although the production of latex has been increasing in the country, there is still a great dependency on imports. This project aims to develop a new methodology which makes it possible to obtain cationic latex from natural rubber on a commercial scale. The preparation of this new raw material entails the collection, the addition of anticoagulant agents and diluted acid, to give a latex with a pH of around 4.5. The entire process of adding anticoagulants and acids should take place in the farm where it is produced. Different anticoagulants will be researched, in different proportions. Subsequently, the treated latex will be centrifuged to determine the pH, the level of solids, particle size, zeta potential, colloidal stability, viscosity and mechanical properties such as resistance to traction, stretching and elastic return. These results will enable the evaluation of quality and the viability of producing the product on a commercial scale.

391 Integrated System for the Obtaining of Georeferenced Information for the Dynamic Control of Water Quality

Coordinator:
Maria Nogueira Marques

Company:
Nexus Geoengenharia e Comércio Ltda.

Approved value:
Phase 1: R$ 73,120

The objective of this project is to obtain systematized information on distributed water quality. In order to do this, the monitoring of the distributed water quality performance will be studied in the form of quality indices, remote transmission of data and the generation of thematic maps. The choice of index should, among other factors, address and check standards of potability; identify possible anomalies in the variable or group of variables; offer fle-

xibility in meeting new parameters or legal requirements, allowing for the inclusion or exclusion of parameters, once they are appropriately evaluated and calibrated; offer flexible periodicity (daily, weekly, monthly or six-monthly). The remote station will be equipped with an alarm system for anomalies.

392 Novogesso

Coordinator:
Milton Ferreira de Souza

Company:
Inovamat - Inovação em Materiais Ltda.

Approved value:
Phase 1: R$ 74,370

The project aims to demonstrate the technical viability of the making of phosphoplaster boards and molds, straight plaster and beta-phosphoplaster mixtures through an innovative process. The following stages are anticipated: 1) development of a device to dampen the hemihydrate powder in a continuous form; 2) development of a compactor capable of promoting the conformation and hardening of the dampened hemihydrate into dihydrate (plaster board); 3) comparison with results obtained with pieces compacted by a standard uniaxial press; 4) submit to the National Institute for Industrial Property (INPI) a patent request for the details of the process developed and also the equipment; 5) establish contact with phosphoplaster producers to ascertain the safety aspects related to the use of this material or its association with beta plaster in civil construction; and 6) initiate contacts with parties potentially interested in the technology under development. The products obtained will be characterized as for their mechanical properties (resistance to compression, to bending and to impact) and porosity. Dimensions will be studied that will permit the use of the boards in partitions. At the end of the project, the equipment will be used in the development of other products based on Portland cement, cellulose fiber and plaster composites, plaster-cement composites and thin cement boards.

393 Development of High Capacity Oxygen Generating Equipment

Coordinator:
Miqueas de Oliveira Braga

Company:
Ecozon Ind. Com. Imp. e Exp. de Equipamentos Geradores de Ozônio Ltda.

Approved value:
Phase 1: R$ 74,523

This entails the development of a piece of equipment to generate ozone by corona discharge with a capacity to generate 30 grams of gas per hour, in a single cell. Internally this cell contains several electrodes, encapsulated in stainless steel tubes, bundled in bee-hive form, through which pure oxygen or compressed air circulates. During the passage of the air or oxygen through these tubes, the electrode is activated by a high voltage electrical discharge, which breaks the oxygen molecules apart, permitting the generation of ozone. The equipment will have a transformer, an inverter and a current inductor, which will serve to control the corona discharge within the cell. The generator will also have a microprocessed electronic system which will permit the remote control and monitoring of all the functions of the apparatus. It will also have a safety system which will be capable of sending messages to a computer, cell phone or pager, in case of irregularities in the system. This generator should allow adjustment to the quantity of ozone to be produced, between zero and the anticipated maximum of 30 grams per hour, being capable of adapting to different conditions of use. The innovation in the project enhances the qualities of the equipment produced by Ecozon, the advantages of a cutting edge technology, which should lead to a capacity to generate much more ozone at lower costs when compared to equivalent imported products.

394 Production of Intervariety Hybrids and Segregating Populations of Gerbera jamesonil, with Help from Molecular Biology Techniques, Aiming to Produce New Commercial Cultivars

Coordinator:
Monique Inês Segeren

Company:
ProClone Comércio de Mudas e Matrizes Ltda.

Approved value:
Phase 1: R$ 39,500

In the floristry business, the variety of cut gerbera daisies offers great commercial value due to their

attractive coloring, size and format. There currently exists on the producer market a wide variety of modern gerbera cultivars obtained by means of genetic improvement. But these plants are imported, which leads to the high cost of the seedling (around a third of the product's final cost), in addition to dependence on foreign companies. In this project, traditional improvement procedures by means of sexed crossings should be carried out. The parent plants will be identified by the molecular marker technique in which the gerbera cultivars that display the greatest genetic variety – leading to hybrids of greater strength – will have directed crossings. Seeds will be gathered, individually, after each crossing carried out. The intervariety hybrids obtained will be evaluated according to the character of the flower (format and coloration) and the plant (profiling potential, speed of regrowth after pruning, size and diameter of the stem and characteristics of post-harvest durability.

395 Development of Oxygen Generating Equipment

Coordinator:
Nelson Antonio Félix Beirão

Company:
Ecozon Ind. Com. Imp. e Exp. de Equipamentos Geradores de Ozônio Ltda.

Approved value:
Phase 1: R$ 73,929

This project aims to develop a reliable low cost piece of equipment, with national components, or which can easily be acquired on the national market. The proposal is based on a time-honored process – selective adsorption under pressure – controlling and regenerating the adsorbent element by means of a sophisticated electronic system. The fundamental principle being exploited is that certain substances, zeolites, display the peculiarity of adsorbing nitrogen when subjected to a pressure of 4 to 5 atmospheres. Once the pressure is relieved, the deabsorption of nitrogen occurs, restoring the zeolite to its initial condition. The idea is to build an oxygen generator with the following physical arrangement: two zeolite beds (molecular sieves) connected to a buffer tank. When the operation starts, compressed air at around 5 atmospheres is forced across one of the molecular sieve beds, which retains the nitrogen and lets the oxygen pass through, which continues on into the buffer tank. After a certain period of time the two beds are inverted; the bed that was resting now receives the compressed air, and the one that was operating has its pressure relieved so as to regenerate the zeolite and so on successively. The oxygen which leaves the buffer tank is fed through to an analyzer which reveals the level of purity obtained. A small part of the gas that leaves the buffer tank is diverted to assist in the regeneration of the zeolite bed that is resting. The prototype should be built in such a way as to permit the carrying out of experiments with three different sizes of adsorbent beds.

396 Conception and Development of Prototype User Adaptable Interface for Building Automation Systems

Coordinator:
Nelson Marinelli Filho

Company:
Nelson Marinelli Filho - ME (Ethos Automação)

Approved value:
Phase 1: R$ 45,450

The success of building automation systems for the residential market and low footfall commercial premises depends on two factors: the capability of the interface to adapt to the needs of the customer and the suitability of the price for the market segments they hope to reach. The proposal for technological development presented here is based on the need to create new user interfaces for building automation systems. The stages of the project were defined in accordance with the previous experience of the project coordinator in this market. In phase 1, the objective is to conceive and develop the requirements for this interface up to the level of prototype.

397 Tracking, Monitoring and Debugging Tools for the VisualRT Development Visual Environment

Coordinator:
Nilton César da Silva

Company:
Eonic Brasil Ltda.

Approved value:
Phase 2: R$ 24,800

The objective of the proposed work is the creation of two graphical tools to help the programmer

identify and correct errors which occurred in the implementation phase of real time systems. One tool will be responsible for the debugging and the other for the tracking and monitoring of applications created by the user. They will be integrated with the VisualRT visual environment created by Eonic Brasil to facilitate the development of real time applications which run on parallel machines with high processing power. In addition to offering assistance in debugging programs, the tools referred to will provide, for experienced programmers as well as beginners in parallel programming, the visualization of the mechanisms which control the synchronization, the communication and the task steps which make up a program. The addition of these two tools to VisualRT will create an integrated environment for the development of real time applications, offering support for every stage involved in the implementation of these systems, from the generation of source code to the test phases, debugging and analysis of performance. The economic viability of this environment is quite considerable because, currently there are few commercial software products aimed specifically at the development of real time systems, an area where line commands or difficult to use tools still prevail.

398 Development of National Technology: Production of Integrated Devices for the Quality Control of Images in Radiodiagnostics Equipment

Coordinator:
Paulo Roberto Costa

Company:
Física Médica Serviços e Consultoria Técnica S/C Ltda.

Approved value:
Phase 1: R$ 70,330

A decision by the Ministry of Health decrees that every establishment possessing radiodiagnostics equipment should carry out, periodically, tests that guarantee the quality of the images generated, as well as the minimum exposure to radiation for their users (patients and professionals). The aim of this project is to prove the viability of the development of integrated simulator objects for quality control trials in diagnostic radiology (phantoms) and procedures which will make these trials faster and cheaper. With these project aims achieved and national technology generated, the costs of the main requisites for geometric trials should significantly decrease, allowing for increased offer of the quality control service in radiodiagnostics and compliance with the legislation mentioned above. Furthermore, the procedural routine will be optimized, streamlining the application of the tests for the verification of the geometric parameters of the X-ray equipment. In addition, the implementation of new procedures for quality control will permit savings on film, on hours with machine and manpower on hold, with great impact on the reduction of costs in the radiology sector.

399 Improvement and Expansion of Manufacturing Simulation and Management and Factory Floor Supervision Software, for both the National and International Markets

Coordinator:
Pedro Paulo Lanetzki

Company:
Netz Informática S/S Ltda.

Approved value:
Phase 1: R$ 72,535

The aim of this project is to enable improvements and a new platform for the company's solutions, so as to offer concepts, technological innovations and procedures yet to be discovered in the areas of Manufacturing Simulation and Management and Factory Floor Supervision. This new platform should enrich the solutions that exist today, enabling better communication between industrial plants, their control from a single location and access to the situation of each of them wherever they are, at any time, in real time. The real time monitoring of crucial moments in processes and the alerting to any deviations that might occur enables the immediate taking of management and/or corrective actions. The aim is to be able to act at the moment deviations are noticed and not merely be limited to reacting to the report of what actually happened. The warnings could be given in synoptic screens, on the machines themselves and in luminous and/or sonic panels, among other means. The commercial potential of this project is extremely broad, since its implementation will establish Netz Informática in the segment of software developers geared to industrial solutions and will permit the company to compete on equal terms (technology and price) with similar foreign companies in the internal and external market.

400 Development of a Computerized System for the Management of the Fish Production process

Coordinator:
Ricardo Firetti

Company:
Sales e Macedo Assessoria Empresarial S/C Ltda.

Approved value:
Phase 1: R$ 50,070

The export of fish has shown itself to be an excellent alternative outlet for Brazilian production. In this context, the United States, Canada, European Community and Japan are extremely demanding in relation the origin of food products and their information systems, insisting in so-called traceability. This project aims to outline a system that will assist in the management process of fish production, seeking to optimize the monitoring and control of different stages of breeding. This will also permit administrators to visualize an array of information quickly and systematically, enabling the implementation of genetic improvement programs and animal traceability. More than the creation of a simple computer program, this proposal aims to develop a management system that provides support for the control of the activity and decision making. In the first phase, the aim of the research should be reached by: 1) Gathering of information (*in loco*), on the handling of ten different fish production systems; 2) Definition of the scope and logical functions of the system; 3) Analysis of software alternatives to support its development, in which it is intended to define the system's programming language with regard to its use and possible expansion; and 4) Outline of the prototype, which consists in the formatting of the product to be developed in the next stages.

401 Design of High Performance Cryptography Module (HSM)

Coordinator:
Roberto Alves Gallo Filho

Company:
Kryptus Serviços Desenv. Tecnologias para a Segurança da Informação Ltda.

Approved value:
Phase 1: R$ 22,990 / US$ 5,393.93

The project will undertake the development and prototyping of the Mercury module, a Hardware Security Module (HSM) from Kryptus Tecnologias. Mercury will be able to provide advanced cryptography services with a high performance and reduced cost piece of hardware for applications such as electronic authentication and certification of data. The research project involves three main elements: 1) the prototyping of the circuits; 2) the prototyping of protection against physical attacks; and 3) the evaluation of a real random number generator. The prototypes of the circuits, which are at an advanced stage of design, will be implemented under the form of a cryptographic accelerator for PCI scans, using reconfigurable high performance hardware (FPGAs with 130 to 90 nanometers technology) which, together with the on-board processors, will implement the necessary cryptographic mechanisms. These mechanisms, once implemented in VHDL, will be adapted to function on the platform and evaluated regarding their cost-performance relation. The prototyping of mechanical protection from physical attacks will involve the creation of elements which, at the same time, display the evidence and protect against attempts to alter the device. Random number generators with real entropy sources will be built and evaluated. The statistical analysis of results will be carried out under trial attacks.

402 Development of Heat Pumps for Residential and Industrial Applications

Coordinator:
Rodrigo Aparecido Jordan

Company:
Thomson - Tecnologia em Energia Térmica e Bombas de Calor Ltda.

Approved value:
Phase 1: R$ 31,807

The present proposal is aimed at the development of heat pumps for residential and industrial application, as well as hotels and agroindustry. Heat pumps are very efficient for use in heating air and water, being able to produce a thermic effect three to five times greater than the electrical energy used to generate it. With an electric resistor, a commonly used device in Brazil, it would be difficult to achieve a greater thermic effect. On the other hand, a refrigerator can also work as a heat pump. Thus, in the case of applications in the home or in hotels, the

heat pump can, simultaneously, air-condition the rooms and heat water for baths, for use in the kitchen and in the swimming pool. In this way, existing refrigerating units can be adapted at relatively low cost to operate as heat pumps. In the first phase of this project, tests will be carried out on a water-water prototype, developed by researchers from the State University of Campinas (Unicamp) for use in agroindustry. Given the characteristics of its construction, it could even be used in other applications. A prototype low cost heat pump for residences will also be assembled so as to carry out tests.

403 SuperVision: Support System for Railway Logistics and Operation

Coordinator:
Rodrigo Almeida Gonçalves

Company:
C-Flex Computação Flexível Aplicada Ltda.

Approved value:
Phase 1: R$ 58,160

The proposal aims to create a system that monitors railway operations and offers input to assist in decision-making in either active or passive form. In passive monitoring, the system observes, in real time, the essential variables to characterize the state of the operation (such as position of trains, number of wagons in the yards, maintenance times, the condition of locomotives, among others) and detects situations of potential risk or damage, in the present or future. The system then sends messages to the railway operators and supervisors, communicating the occurrence of significant events so that, in good time, they can make the relevant decisions and, therefore, avoid risks and damage. In active monitoring, in addition to supervising the state of the network, yards, trains and traffic, the system helps in the supervision and control of traffic, assists in the planning and optimization of traffic on the network, in the traffic logistics and multimodal operation. SuperVision is a project with multiple objectives and work fronts. To implement it in a monolithic manner would be very risky and costly. Thus, to control the risk, the quality and the cost, the system was divided into six sub-projects, some of which already implemented. The proposal now is to implement the rest of them so as to consolidate the SuperVision system.

404 Quantitative Genetic Evaluation of Ostriches (Struthio camelus) in the State of São Paulo

Coordinator:
Rodrigo Possa Bertazzo

Company:
Bianco Avestruz Ltda (ex-Brasil Ostrich)

Approved value:
Phase 1: R$ 43,876

Market niches based on breeding animals and products derived from the ostrich such as meat, leather, eggs and feathers could be extremely interesting for Brazil. However, for production to be able to cater for the growing demand it is necessary to integrate the efforts of researchers, selectors, commercial breeders, the refrigeration industry and the government. The present project aims to generate research on the genetic quality of ostriches so as, subsequently, to implement in Brazil a program of genetic improvement for these birds and generate the necessary genetic evaluations so that producers, from a digest of ostriches, can correctly choose the animals that will serve as reproducers in the future. The project includes the measurement of weight characteristics linked to the weight of birds at different ages; reproductive characteristics to be studied, such as libido and number of eggs, among others; and pathologies such as navel infection and splayed legs. The necessary genetic parameters for the prediction of heritability and genetic correlation, will be obtained by means of the use of the MTDFREML (Boldman e Van Vleck, 1995) system. For the solution of mixed model equations, the ABTK (Golden et al., 1992) and TKBLUP (Golden *et al.*, 1995) software suite will be used. The Linux operating system should be adopted as well as SAS and FOX software for the manipulation and consistency of the database.

405 Innovations in pH and Conductivity Meters

Coordinator:
Santos Demetrio Miranda Borjas

Company:
Anatech Equipamentos de Medição e Controle Ltda.

Approved value:
Phase 1: R$ 68,680

This research aims to develop a pH and conductivity meter in a single device for use in the field (environmental analysis) and laboratory. The choice of this project is based on the existing deficient technology in the Brazilian market in the manufacture of this type of equipment and in the experience of the members of the team in analytical instrumentation. Owing to environmental legislation, globalization and current quality norms, there has been a growing increase in imports of these instruments. As a consequence, in addition to the high cost of laboratorial analyses, a deficit in the country's trade balance has been noted in this segment. The equipment to be developed should have an extremely accurate measuring system (1 per cent full-scale accuracy or better), and the ability to store data with date and time of acquisition to generate reports on printers or computer. The equipment should include innovations such as automatic detection of more than one type of temperature sensor; rechargeable batteries; recall of last adjusted temperature value for pH manual compensation; and conductivity, in this respect, surpassing imported models. The equipment will have guaranteed application in the chemical industry and principally, in laboratories and institutions engaged in environmental monitoring.

406 Hydropneumatic Linear Position Controller

Coordinator:
Sidney Nogueira Pereira de Jesus

Company:
Hydrex Comercial Hidráulica Ltda.

Approved value:
Phase 1: R$ 45,200

The aim of this project is to develop a hydropneumatic linear position controller. The system is compact and contains in the same block a hydraulic actuating piston, two pneumatic control actuators controlled by two pneumatic valves of the on-off type, an electronic control system and a sensor to monitor the misalignment of the actuator and to generate a signal to shut off the control network. The idea is innovative and seeks to fill a need in the market for precision linear positioning for small alignments and heavy weights, such as the positioning of cylinders in the lamination, paper and cellulose and plastic films industries and valve opening control in the petrochemical and food industries, among others. The alternatives currently used are based on conventional servo-hydraulic systems, costly to acquire, install and operate. The device proposed in this project should be a very much simpler alternative, cheap, easy to install and operate. The system is compact and uses as its power source the conventional pneumatic line normally available in industrial plants. The design for the platform is in progress and, in the course of the first phase, it is intended to build the device and carry out several experimental tests for a detailed analysis of its technical viability.

407 On-Line Sales Tool

Coordinator:
Wagner Palmiere

Company:
Siena Soluções Tecnológicas e Com. Ltda.

Approved value:
Phase 1: R$ 35,016.31

The objective of this project is to develop a system which enables commercial transactions for products directly at the point of sale. The solution should permit the remote generation of checks on customer registration; condition and availability of product stock; placing of orders; delivery confirmation to the central base evolving from the sales venue; generation and issue of receipt referring to all the transactions, with printing to be carried out on the delivery van through an on-board printer. The On Line Sales Tool system uses Java (J2EE) language for the development of the application; Java (J2ME) for the development of the collector (PDAs) applications; GSM or CDMA technology for the remote integration of the collectors with the application server; the MySQL server as database; Jboss on the application server; and Linux as operating system. The ultimate expectation is to obtain a system that runs remote real time/online communication with the central database, so as to carry out customer checks and transactions, using for this purpose PDFAs and communication via GSM or GDMA. The possibility of implementing open source platforms in the architectonic make-up of the solution will make possible a system the final price for which should consist merely of the license for the operational use of the application and the cost of customization and parameterization, which, it is hoped, will lead to the popularization of the product.

19th BIDDING INSTRUCTIONS

408 Development of Humidifier for Fuel Cells

Coordinator:
Angelo Massatoshi Ebesui

Company:
Electrocell Ind. e Com. Ltda.

Approved value:
Phase 1: R$ 39,800

This project aims to study and develop a gas humidifier for 5 kilowatt fuel cell which should offer greater efficiency and durability to the cells' polymeric membranes. Three different types of prototype of a humidifier for 5Kw cells will be analyzed, built and tested, for subsequent selection of the winning technology. The following will be tested: 1) solid ionomer capillary tubes; 2) proton selective membrane associated with the cell; and 3) nebulizer and atomizer. The prototype with validated technology will be developed and refined for a fuel cell with 50 Kw power (five 10 Kw modules), in the Aneel/Eletropaulo project, supported by FAPESP, which is in progress. The expectation is that the development of this proposal will establish the technological consolidation of a complete package of the development of fuel cell with the application of the intelligent system concept. The validation of this development will bring the company and the team involved the expertise to commence scaled production, concomitantly with the final fuel cell tests and trials. The cells to be produced should ultimately have a power of 50 Kw for use in residential buildings, industries, hospitals and schools, among other consumers.

409 Production of Silica-Aluminous Fire Bricks with Chamotte Produced at Low Temperature

Coordinator:
Arnaldo Carlos Morelli

Company:
Deflotec Indústria e Comércio de Produtos Refratários Ltda.

Approved value:
Phase 1: R$ 65,300

There has been a growing demand for silica-aluminous and aluminous firebricks for medium and low duty applications in important industrial segments. The small profit margin in current silica-aluminous bricks, for medium to low duty use, has limited their availability on the market, which obliges the user to use products of a higher aggregate value and, consequently, to end up with higher costs. In the light of this, this project proposes, in its first phase, a broad study to establish the production conditions of the firebricks of the classes mentioned, at low cost and of good quality. For its sole component, what could be called chamotte should be used, which is produced at low temperature, and is then directly pressed and fired, giving the classes referred to. This proposal is based on positive preliminary tests which need to be more closely checked, under the umbrella of normalized trials of a greater range of possible compositions. The development of this technology should result in an important innovation, considering that the immediate benefit from its implementation will involve the abolition of common stages in the conventional processing of refractory aggregates, such as chamotte pre-firing (1300-1500ºC), its milling and granulometric separation. The refractories to be produced by the proposed new route will certainly offer a more homogeneous aspect and more uniform texture, retaining the attributes of conventionally produced refractories, intended for similar applications.

410 Development of an Electronic Ear Tag for Cattle Identification

Coordinator:
Carlos Gustavo de Camargo Ferraz Machado

Company:
Korth RFID Ltda.

Approved value:
Phase 1: R$ 81,900

The Ministry of Agriculture is implementing Sisbov, a system which aims to identify, record and monitor, individually, all the cattle and buffaloes born in Brazil or imported. According to the chronogram, the entire national herd should be entered in the system by December 2007. Identification can be achieved by means of a conventional plastic ear tag, firebrand or tattoo, which gives the user the animal's identification number or code. Electronic identifica-

tion systems record the animal's number on a collector together with data such as weight and vaccines. The collector transfers the data to the computer (PC) through a serial connection. The process is error free. The electronic ear tag is a management tool which enables an improvement in the efficiency and competitiveness in the rearing of slaughter or dairy cattle, pigs, sheep and goats. However, it is an expensive system, which makes it unviable for the vast majority of producers. The aim of this project is to develop and train the company to manufacture, at low cost, this electronic identification ear tag. Its design entails the development of the transponder, which is an electronic device which retains a number in its memory and, when activated by radio frequency, transmits the data to a receiver. This involves an innovative proposal by promoting the development of a technology held by few companies in the world.

411 Research and Development of Microprocessed, Portable, and Low Cost Videolaparoscopy Equipment, with Functions for Monitoring and Recording Vital Signs and Images

Coordinator:
Carlos Magno de Oliveira Valente

Company:
Sensoft Comércio de Materiais para Informática, Software, Consultoria e Treinamento Ltda.

Approved value:
Phase 1: R$ 84,170

Carrying out abdominal surgery by laparoscopy requires an insufflator, a piece of equipment responsible for distending the peritoneal cavity with CO_2; an external light source, for illumination of the cavity, which permits the visualization of the interior of the abdomen; microcamera, responsible for the capture and projection of the image on a monitor; and forceps, specific to the surgical procedure. The laparoscopy equipment industry is virtually nonexistent in Brazil. Imported products have a very high cost and the tendency to be sold in modules. The present lack of integration between the laparoscopy equipment items means that the surgeon has to acquire various systems which take up a large amount of space, making their handling, control and transport difficult. In this context, the objective of the present project is to respond to the laparoscopy equipment market, which is growing, with a national product which is low cost and which has differentiated resources which will make it innovative and competitive. The principal advantages of the product should be its portability, the integrated and easy to use control interface, its resources for televideolaparoscopy (sharing images in real time via local network and/or the internet), digital documentation, automatic luminosity control and its safety features.

412 Development of a Sugar Cane Productivity Monitor to Obtain Productivity Maps for Self-propelled Harvesters

Coordinator:
Domingos Guilherme Pellegrino Cerri

Company:
Enalta Inovações Tecnológicas para Agricultura

Approved value:
Phase 2: R$ 207,361

Much of the research carried out in precision agriculture is concentrated on the development of corrective dosers and evaluators of yield for grain crops such as wheat and soya, which are products cultivated in sub-tropical areas and predominantly in developed countries. Thus, in this project the cultivation of sugar cane was chosen because, in addition to being of great economic importance in Brazil, it has barely been explored by precision agriculture techniques. This project aims to instrument a sugar cane harvester, so as to be able to obtain the productivity map for this crop. The system to be refined is based on the productivity monitor designed, developed and patented by the State University of Campinas (Unicamp), with support from FAPESP. The equipment uses weighing cells as an instrument for determining the weight of the raw material harvested and will be capable of measuring the flow of stalks that pass over the belt before being thrown into the transporting vehicle. This data, together with the information obtained from a Differential Global Positioning System (DGPS) installed in the harvester, permits the creation of a digital map which represents the production surface for the harvested area. This system will be tested in the laboratory and in the field.

413 Study of the Viability of the Development of Software for Natural Vulnerability to Pollution in the Physical Environment

Coordinator:
Fabio José Meaulo

Company:
Fortgeo - Geociências e Meio Ambiente Ltda.

Approved value:
Phase 1: R$ 42,678

The proposal presented here aims at developing a piece of software for evaluating natural vulnerability to pollution in the physical environment which may contribute to decision making on the part of the municipal public manager. This product is based on knowledge of the geology and hydrogeology of the area where the municipality is located. In other words, the software will assist in suitable strategies and actions for the different forms of human intervention in the physical environment. The development of the proposed computational program will be formatted in a language compatible with the Windows environment, easy to use and of low operational cost. The Software information system is segmented in three groups: 1) entry of data on the physical environment, sources of pollution, federal and state legislation and the valuation of real estate in the municipality; 2) database generating system; and 3) output of processed data in the form of reports, graphs, and digital cartographic documents. The final product of this project should be characterized by its high potential for commercial and social return. The software for mapping natural vulnerability to pollution in the physical environment will be made available to teaching and research institutions and small municipalities in the State of São Paulo

414 Development of Cartridge Type Sinterized Metal Filters

Coordinator:
Francisco Ambrózio Filho

Company:
BRATS Indústria e Comércio de Produtos Metálicos Especiais Ltda.

Approved value:
Phase 1: R$ 99,000

In the chemical and food industries, the metal filter, normally produced by powder metallurgy, is subjected to conditions which demand high mechanical resistance and, very often, high resistance to corrosion at high temperatures. A material normally used is stainless steel, although nickel alloys can be an alternative. Both the chemical industry and the food industry import significant numbers of filters in tube form, tall (up to 1.10 meters), with a thin wall (around 2mm.), known as cartridge filters, preferentially used because they offer an extensive filtration area and, therefore, permit greater discharges of filtered fluid. It is known that, for a specific type of application (herbicides), nickel (Ni200) cartridges are used and, in this case, problems of structural integrity have been observed. This project seeks to evaluate the production of stainless steel cartridge filters by the soldering and calendaring flat sheets. The sheets will be manufactured by two routes: uniaxial compactation and vibration. The focus here is the manufacturing process and whatever is developed for stainless steel will work for nickel and other alloys. In this first phase of the project, the objective is to arrive at a prototype which can be tested on the equipment of a customer already contacted. This prototype will probably be produced by vibration, since there are dimensional limitations to the uniaxial compactation process.

415 AbEvo - (Antibodies Evolution). Intelligent System for the Development of Antibodies Based on the Structure of the Antigen

Coordinator:
Humberto D´Muniz Pereira

Company:
Cientistas Associados, Comércio, Representação, Consultoria e Treinamento Ltda.

Approved value:
Phase 1: R$ 82,480

This project proposes the creation of a computational tool for the development and optimization of antibodies (AbEvo) driven by the structure of a given antigen (in silica evolution). Inspired by the successful programs outlined for the planning of medicines, the tool aims at a reduction in cost, in development time and to facilitate the steps in the production of antibodies. In its first phase, the project envisages the development and prevalidation of the tool which, in

the second stage, will be fine tuned and validated. Among the advantages expected from antibodies conceived using this methodology, the most outstanding is the prevention of hypersensitive reactions caused by the structural reduction stemming from the use of single-chain antibodies (scFVs). The other advantage is that the conception of the proposed tool is perfectly suited to the expression of antibodies in bacterian systems which, consequently, should reduce the time and cost of production. The tool can also be useful for the optimization of antibodies, reducing the occurrence of non-specific molecular recognitions by means of the refinement of molecular interactions. The commercial possibilities prospected on the basis of AvEvo include biomedicines, imaging diagnostic markers and development of diagnostic kits, among others.

416 Production of Human FSH by Recombinant Engineering

Coordinator:
Karla de Melo Lima

Company:
Nanocore Biotecnologia Ltda.

Approved value:
Phase 1: R$ 69,480

The present project aims to optimize a technique for the production of follicle-stimulant hormone (FSH) obtained by recombinant technology from mammal cells, developing a process for the commercialization of the first recombinant produced in Brazil. This concerns an innovative proposal which originated in the University of São Paulo, the industrial process for which will be developed in partnership with Nanocore. The implementation of this project will be fundamental to confirm the industrial inventiveness and viability of the process, with the ultimate goal of securing the registration of their intellectual property. The intention is to optimize and outline the steps for the production and purification process of rhFSH in conditions of good manufacturing practice for use in human medicine. Among the specific objectives of the project, the following should be noted: 1) the characterization of the rhFSH producing clone; 2) the creation of a Reference Cell Bank and a Working Cell Bank as reliable and continuous sources from which the rhFSH can be consistently produced; and 3) the establishment of the culture in bioreactors, evaluating the cell growth kinetic, the consumption of substrate and the production of rhFSH and metabolites under different conditions in order to establish the most efficient process for the culturing and production of the biomedicine on a pilot scale. The production of FSH with national technology will bring a series of benefits, amongst which a reduction in the end price, which makes it possible to contemplate its early introduction into the internal market.

417 Research and Development of Construction Process Using Pre-Fabricated Armed Concrete Panels Reinforced with Expanded Polystyrene Core: Application for One-Storey Houses

Coordinator:
Luciana Alves de Oliveira

Company:
R.C. Construções Ltda.

Approved value:
Phase 1: R$ 65,020

The objective of this project is to research and develop a construction process using panels of prefabricated armed concrete reinforced with expanded polystyrene core for use in one-storey houses. The work includes the evaluation of performance with regard to compliance with the regulations laid down by law in Norm CE 02.136.01, of the Brazilian Association of Technical Norms (ABNT) for buildings of up to five stories. The viability study to be undertaken in phase 1 of the project, involves the stages of data gathering/theoretical analysis of the performance of the proposed construction process; analysis and evaluation of the existing interfaces; study of the dosage of concrete to be used in the make-up of the panels; creation of a base-architectonic design; manufacture of the panels and assembly of the prototype; performance trials and their respective evaluation; and, finally, evaluation of the technico-economic viability of the proposed construction process. The appropriate development of a construction technology such as this has many technical contributions to give to the sector, such as the consolidation of prefabricated construction methods and processes; the introduction of industrialized construction techniques which increase productivity and the quality of the buildings; and the supplying of a finished product that offers guarantees, decreasing the high incidence of pathologies in buildings.

418 Development of Vitroceramic composite for Dental Applications

Coordinator:
Luiz Carlos de Carvalho

Company:
EDG Equipamentos e Controles Ltda.

Approved value:
Phase 1: R$ 84,000

The basic idea of this project is to develop a vitroceramic composite for application in dental restoration aiming for the development of a prosthesis entirely composed of ceramic materials. The manufacture of a restorative composite of this type is a challenge for materials science and engineering, since generally the work requires short processing times and low retraction during thermic treatment. In addition, the ceramic restoration needs to be translucent and offer high resistance to fracture. Therefore, the strategy to be employed is to develop a porous ceramic matrix or skeleton in which a glass will be infiltrated, producing in this manner, a composite. The creation of the vitroceramic prosthesis aims to replace the current metal-based dental prostheses. This development should permit the EDG Equipamentos to enter the market of consumable dental materials, as well as diminish Brazilian dependence on imported dental materials.

419 Application of Ceramic Coating on Metal Surfaces

Coordinator:
Luiz Gustavo Pagotto Simões

Company:
Science Solution Ltda.

Approved value:
Phase 1: R$ 77,888.48

In recent years, the development of nanostructured ceramic materials and fine films has progressively increased, with coating applications in the automobile industry and even in the textile industry. This project will address fundamental aspects of the synthesis and processing of materials, as well as technological aspects such as optical, chemical and bactericidal properties. It is intended to synthesize by the polymeric precursor method Zr02, Ti02 and AI203 (ceramic materials) and deposit fine films by means of dip coating with anti-abrasive, bactericidal and aestivating properties. These coatings will be applied on metal surfaces, but specifically on steels.

420 Production of Adsorbents and Chiral Columns and their use in the Process to Obtain Nantiomerically Enriched Substances through Liquid Chromatography

Coordinator:
Marcos José Souza Carpes

Company:
(Under Formation)

Approved value:
Phase 1: R$ 83,800

The growing importance attributed to the use of nantiomerically pure medicines, that is, in the form of a single optical isomer, has awoken the interest of the pharmaceutical industry and the scientific community in the development of sophisticated separation techniques of chiral compounds, used mainly as medicines. Liquid chromatography is a technique for obtaining pure nantiomers which stands out amongst other techniques, principally after the development and commercial availability of chiral stationary phases recognition of high quality and capacity, which operate under severe pressure conditions and with various types of moving phase. Within chromatographic processes, a system which awakens great interest in the separation of chirals is the continuous process known as simulated moving bed (SMB) which surpasses, in productivity and savings on solvent, traditional batch chromatography, with no diminution in the purity of the products generated. Aiming for the establishment of this technology in Brazil, the Department of Biotechnical Processes in the Faculty of Chemical Engineering of the State University of Campinas (Unicamp) set up an SMB unit for the separation of racemic mixtures. Coinciding with setting up of the unit, research was undertaken into the development of adsorbents of chiral recognition based on polysaccharides for the production of chromatographic columns used in SMB. The company being set up should carry out activities which involve the technologies studied and developed, such as the application of liquid chromatography for the separation of racemics and the production of chiral stationary phases for the production of columns, on an analytical or preparatory scale, which could eventually be commercialized or applied to SMB.

421 Development of Unit for Plasma Treatment of Town Refuse, with Production of Synthesis Gas

Coordinator:
Maria Antonia dos Santos

Company:
Multivacuo Indústria e Comércio de Filtros Ltda.

Approved value:
Phase 2: R$ 399,533.60

Taking as its premise the growing need to develop safe processes for the final destination of different types of refuse, the present project's main objective is to propose an innovative concept of a factory for the treatment of those materials. This entails a development that will permit a final destination for refuse of diverse origin, in a safe, efficient and competitive way. To do this, thermic plasma will be used as a means of very high temperature treatment, conceived for the production of synthesis gas (SG) and integrated with a gas turbine, under development in the company making this proposal, for the co-generation of energy. Based on developing and developed technologies, on the technical expertise and the accumulated experience of the project partners – Institute of Aeronautical Technology (ITA), Institute for Technological Research (IPT) and Multivácuo – it is proposed in this phase to build an thermic plasma experimental factory with capacity to destroy up to 100 kg/h of solid dry material. The plasma reactor will be redesigned on the basis of an oven already used in earlier research on the treatment of waste from the galvanoplastics industry. Inside it will use already developed plasma torches of the transferred and non-transferred arc type. Accessory systems already existing in IPT will be recovered and used, amongst them power sources for plasma, a system for demineralization and ionization of water for plasma torch and source. The materials to be used for the initial trials will be specially prepared so as to simulate waste products known as RDF (refuse derived fuel), with special care not to introduce organochlorated matter which during pyrolysis can produce extremely dangerous compounds, such as dioxins and furans.

422 Staged Production of Banana Seedlings in Three Models of Bioreactor. Challenges of Optimizing the Marriage of Micropropagation Techniques for the Supply of Healthy Genetically Improved Banana

Coordinator:
Reusi Inês Bossi

Company:
ProClone Comércio de Mudas Matrizes Ltda.

Approved value:
Phase 1: R$ 81,800 / US$ 2,150

The initial objective of this project, in its first phase, is based on the evaluation of the efficiency of three types of bioreactor with regard to the technology employed: temporary immersion, bubbling and nebulization. The equipment will be used in the *in vitro* micropropagation of bananas, in comparison with the traditional procedure. The evaluation of the bioreactors' efficiency will be based on the following criteria: operational performance; reduction in the use of biological material (culture medium); minimization of infrastructural costs (especially electric energy); multiplication rate of seedling *in vitro*; and average time for acclimatization, robustness and health in the seedlings. With the most efficient bioreactor chosen, in the second phase it is intended to establish the protocols for micropropagation which permit the multiplication of seedlings above the fifth subculture, actually a limiting factor permitted without the occurrence of somaclonal variation. Meristems of several banana clones will be installed and indexation will be carried out for the virus.

423 Use of Cell Culture in Monitoring Toxicity and in the Investigation of Anti-Tumoral Compounds: Evaluation of Cell Death

Coordinator:
Patrícia da Silva Melo

Company:
STQ Comércio e Serviços de Tecnologia Química Ltda.

Approved value:
Phase 1: R$ 44,000 / US$ 17,749.00

The main objective of this project is to evaluate the cytotoxicity of xenobiotics, chemical and natural compounds, medicines, products used in the cosmetics industry and the effluents in the paper and textile industries subjected or not to treatments aimed at detoxification on several cellular models: the culture of V79 cells, leucemic cell lines and the primary cultures of hepatocytes isolated from fish and rats. Analysis of the viability in V79, leucemic and hepatocytes cells, will be carried out by means of usual toxicity indicators, such as: reduction of the MTT, incorporation of neutral red, tripan-blue exclusion and quantification of nucleic acids. In the hepatocytes, in addition to the tests mentioned, the activity of the metabolization system of xenobiotics (cytochrome P450 and conjugases) will be evaluated, given that the liver is recognized to be the main place for biotransformation. Keeping in mind the application and the characteristics of different cellular types in toxicity evaluations, this project will have, therefore, as an overall objective the monitoring of the degree of toxicological compromise using, for this, models of cell cultures and cytotoxicity tests, evaluating the induction of cell death by apoptosis and measurement of enzymatic activities of the hepatic detoxification system.

424 Airborne System for Acquisition and Post-Processing of Images Taken with Digital Cameras

Coordinator:
Roberto da Silva Ruy

Company:
ENGEMAP - Engenharia e Mapeamento Ltda.

Approved value:
Phase 2: R$ 130,975 / US$ 96,220

With the evolution of digital sensors for the acquisition of images, the use of digital cameras has grown in photogrammetry, especially non-metric cameras, given that metric cameras are very expensive and present problems with image storage and management. Furthermore, if the non-metric cameras were properly calibrated, they could offer quality information, combined with the advantages they offer, such as flexibility regarding focusing interval. They are small, easy to use and their cost is low when compared with metric digital cameras. However, digital cameras have some limitations, such as the instability of the internal geometry of the camera (focal distance and position of the main subject) and the limited resolution of the CCD sensors. Case studies have shown that these problems can be circumvented, making it possible to use the full potential of this type of sensor for thematic, topographical and subscription mapping of small areas, with great flexibility compared to conventional aerial and orbital sensors. In this project it is intended to evaluate some alternatives and develop a methodology which permits the use of non-metric digital cameras for mapping. It is intended to study and implement a platform with two converging cameras and verify its applicability to mapping, taking into consideration the problems of instability of internal orientation parameters and image quality.

425 Miniaturized Fluorescence Detection Systems for DNA Analysis

Coordinator:
Sandro Hillebrand

Company:
Cientistas Associados, Comércio, Representação, Consultoria e Treinamento Ltda.

Approved value:
Phase 1: R$ 97,362

This project aims to develop a system for detecting miniaturized fluorescence for application as a detector in separation techniques geared to DNA analysis. The general objective of phase 1 is the development of a system for the detection and conditioning/acquisition of the signal which will be applied, in the second phase, in the building of an instrument for genetic analyses (such as paternity exams and the detection of transgenics, among others) or even in the sequencing of DNA. The specific objective of the first phase of the project is to transfer, from the academic environment to a technology-based small company, knowledge about the building of a system for detection by fluorescence, taking into consideration aspects relating to its application for DNA analysis. In addition, the technology will be developed in such a way as to make it possible to build a commercially viable prototype. It will be linked up to a modular capillary electrophoresis system for the evaluation of performance and validation in the analysis of fragments of DNA, marked with fluorescent colorings. In addition to this main application, the technology employed in the system could be used in other instruments, such as systems for flow analyses, Elisa plate readers, PCR in real time and in chro-

matography and electrophoretic separation techniques. The innovation introduced in this project is the use, in the same system, of LEDs as an excitation source, avalanche photodiodes as detectors of emitted fluorescence and the synchronous detection in the signal conditioning for the analysis of DNA.

426 Software for the Registration of Water Supply and Sewage Collection Networks with Space Databases

Coordinator:
Victor Emanuel Mello de Guimarães Diniz

Company:
Nexus Geoengenharia e Comércio Ltda.

Approved value:
Phase 1: R$ 27,126 / US$ 2,560

This project aims to prove the technical viability of the development of a low cost computational system on a state of the art georeferenced platform, for the registration and consultation of urban water supply and sewage collection networks. The end users will be the autonomous water and sewage utilities operated by the prefectures in around 50 per cent of the country's municipalities. Automatic registration and consultation are vital tools in the management of water and sewage systems, being mandatory for the improvement of quality, sustainability and efficiency of these systems. The projected system will have three modules. The first is the registration module, consisting of an editing and data feed graphic-based interface of the QT or MFC standard, capable of designing or importing elements from the most common design packages such as Autocad, Microstation, and even from a georeferenced system. The second module consists of a database on the latest generation platform, Oracle IX standard, PostgreSQL and even a free access relational database. The third module, for registration enquiries, will permit access to the information from enquiry stations to a free access map server, through the Terralib system. The viability of the project should be proven by the establishment of a prototype of the system in the offices of an autonomous water utility company in the State of São Paulo.

427 Development of Injected Graphite Composites Applied in Electrochemical Processes

Coordinator:
Volkmar Ett

Company:
Electrocell Ind. e Com. Ltda.

Approved value:
Phase 1: R$ 45,800 / US$ 9,840.07

The technology acquired by the company with the support of FAPESP culminated in the development of the largest fuel cell in the southern hemisphere, a unit generating 50 kilowatts (Eletropaulo project) with remote monitoring via internet. The project presented here now aims to develop graphite compounds to be injected into molds with the desired technical characteristics. The result should establish the technological consolidation of a complete fuel cell development package with the application of intelligent system. The validation of this development will bring expertise to the company and the team involved for the start of scaled production concomitant with the final tests and trials of the fuel cell. This cell should ultimately have a power of 50Kw for use in residential buildings, industries, hospitals, schools, to offer a low level of electricity supply to deprived communities that do not have access to the distribution network and, especially, to users who require high levels of quality, low rates of power loss and great reliability. With the development of this project, a vital stage in the generation of electricity from fuel cell, the company will be ready to begin production of these cells with entirely national technology and peripherals.

20th BIDDING INSTRUCTIONS

428 Determination of Ferrite Level in Duplex and Superduplex Austenoferritic Stainless Steels, in Relation to the Variables: Chemical Composition, Solidification Mode and Thermic Treatment of Solubilization

Coordinator:
Alain Jean Isore

Company:
Grupo Engenharia Ltda.

Approved value:
Phase 1: R$ 55,920 / US$ 5,338.67

The aim is to design and optimize the microstructure of duplex and superduplex stainless steels by means of control of the process variables to increase reliability in the use of parts cast for the manufacture

of components in pumps and valves. The manufacturing conditions of castings of austenoferritic stainless steels have a great influence on the microstructure, which could have deleterious and even catastrophic effects on the mechanical, resistance to corrosion and soldability properties. In particular, of fundamental importance is the control of the quantity and the morphology of the austenitic and ferrite phases which are its basis, as well as ensuring the absence of fragilizing phases such as the sigma phase. The composition ranges specified by international norms are much broader than those permitted by the restrictions imposed on levels of ferrite and no systematic data is available correlating microstructure with chemical composition, conditions of solidification and solubility in duplex steels defined by the most common norms. The intention is to collect this data on duplex and superduplex alloys defined by international norm ASTM 890M, of the American Society for Testing and Materials, and also to examine the effect of variations in microstructure on the other characteristics. In the first phase, samples with four different compositions will be cast of two of the alloys defined by that norm with cooling conditions, reproducing what happens in real pieces, and treatments with variation of the temperature of solubility. The fractions and morphology of the ferrite will be determined, as will the presence of sigma phase, and traction, hardness and resistance to impact tests will be carried out. In the second phase, tests on resistance to corrosion will be carried out and a deeper study will be undertaken of the solidification conditions, mapping variations in the structure with regard to the position of a representative part of most frequently used castings. Experiments will also be carried out with products obtained by centrifuged casting and with micro-additions for structural refinement.

429 Conformation-Specific Antibodies: Proposal for Generation of Antibodies Directed at Receptors Linked to Active G protein (GPCRs)

Coordinator:
Andréa Sterman Heimann

Company:
Proteimax S/C Ltda.

Approved value:
Phase 1: R$ 45,000 / US$ 6,000

Receptors attached to the G (GPCRs) protein have shown themselves to be an interesting therapeutic target. Thirty-nine of the 100 most commonly used drugs in clinics act directly or indirectly through the activation or blocking of receptors of the GPCRs (Menzaghi et al. 2002) type. The production of antibodies which recognize a specific conformation of GPCRs (active or inactive) represents a new and powerful technique which may be used to examine the duration and extent of physiopathological stimuli directly, which is important for basic and clinical research. In addition, this technique could create a fast and cheap screening tool for the identification of drugs that are allosteric modulators of GPCRs, enabling the development of drugs (which could be of great therapeutic and economic value) with the power to activate or inhibit GPCRs in smaller doses. Proteimax, perceiving a great consumer market for antibodies with conformational specificity, intends to produce antibodies that recognize activated GPCRs, as well as normalizing antibodies for protein quantification tests, supplying a unique, high quality product for studies related to GPCRs.

430 Optic Device for Broadband Integrated Access

Coordinator:
Aldemar Fernandes Parola

Company:
AsGa S/A

Approved value:
Phase 2: R$ 399,980.50

Among the current products developed and commercialized by AsGa are the 2E1 Ad optic modem and media converters. The 2E1 Ad optic modem, which represents about 10 per cent of the company's turnover, needs to be redesigned due to the obsolescence of some of its components. Taking advantage of this idea, it is intended to develop three new products to cater for new market segments. These are 1) the MMO 2E1 Ad Plus – multiplexer and 2E1 optic modem with E1, V.35/V.36 tributaries and Ethernet with 4Mb/s rates on the electrical aggregate and 8 Mb/s on the optical aggregate; 2) the CM2E1 – multiplexer and 2E1 optic modem mounted in a chassis of media converters; and 3) the B-IAD – optic device for integrated broadband access with E1, V.35/V.36 tributaries and Ethernet with 68 Mb/s rates on the electrical aggregate and the optical aggregate. Since it is suspected that this last device will be exported to other countries, it was named the

Broadband Integrated Access Device (B-IAD). For this same reason, in the initial phase of development, an attempt will be made to bring it up to the T1 and T3 standards required by the United States market, since this will not cause any great rise in cost for the products designed to meet E1 and E3 standards. The name of the present project is derived from this more complex product.

431 Study of the Technical Viability of a Piezoelectric Flow Pump

Coordinator:
Cícero Ribeiro de Lima

Company:
Inoveo Pesquisa e Desenvolvimento de Produtos e Projetos de Automação de Sistemas Ltda.

Approved value:
Phase 1: R$ 55,900 / US$ 2,500

The development of pumps for precision flow has been taking place in a number of areas (such as bioengineering) for use in the pumping of blood or in the dosage of reagents and medicines. Many of the new principles applied are based on the use of piezoelectric actuators. These actuators offer certain advantages over other traditionally used types, such as greater potential for miniaturization, less noise generation and reduced number of moving parts. Thus, the present project aims to carry out the study of the technical viability of a new configuration of piezoelectric flow pump by means of the elaboration of computational modules, the optimization of parameters and the construction of an experimental bench top prototype to check its functionality. Simultaneously with the technical viability study, two products with potential application in the technology being studied will be researched: water refrigeration systems for processors in high performance microcomputers and blood pumps for applications which involve extracorporeal circulation.

432 Process for Manufacture of Gold Artifacts

Coordinator:
Edval Gonçalves de Araújo

Company:
Regulus Ars Tecnologia em Jóias Ltda.

Approved value:
Phase 1: R$ 99,900

After obtaining colored gold powder by high energy milling in a project supported by PIPE, the company seeks to carry out in this project research into a new way of producing jewelry in Brazil. What is proposed here is the development of the technology of conformation of colored gold powders by compactation and subsequent sinterization. The technological innovation is present in the application of powder metallurgy techniques in jewelry, thus allowing the configuration of complex pieces, which could not be achieved with casting techniques. In addition, the finishing of the jewels occurs with a fewer number of stages compared to conventional techniques. The first phase of this project will research the production of pieces of red (solid solution), purple (intermetallic) and blue (surface treatment) gold alloys. For each colored gold alloy, the following processing parameters will be analyzed: condition for the re-cooking of the powder; temperature and time of sinterization and thermic treatment of the pieces; condition of surface finish. In the second phase, the results obtained should serve as a basis for the production of pieces in the other colors developed: green, white, black, gray, pink, yellow and their tonalities.

433 Production of Peaches in Regions with Low Incidence of Cold

Coordinator:
Fernando Mendes Pereira

Company:
Valdenir Rossi

Approved value:
Phase 2: R$ 48,668 / US$ 76,359.20

Based on previously developed innovative techniques, in 1996 a project was begun with the aim of improving the quality of peach scions. The study examined the possibility of the propagation of stock for grafting using herbaceous material and carried out studies on new grafting stock. In the present project, the objective is to plant high productivity orchards with the production of early fruit of high quality, bringing together all currently available knowledge to test new technologies in the field. Thus, experiments will be carried out on high density planting and on grafting stock obtained from herbaceous cuttings of umezeiro (Prunus mume) clones and from

the cv. Okinawa peach tree. New dual-purpose cultivar crowns will be tested as options for industrialization. Research was programmed into post-harvest procedures to determine the most suitable packaging materials and ideal pick-up points for commercialization in markets close to and far from the production zone. Based on the results obtained it will be possible to establish the region of Jaboticabal (SP) as an important producing center for early peaches.

434 Development of Systems with Anti-static Additive and Conductive Layers for Development of Transmission Belt Used in the Textile Industry

Coordinator:
Zaida Jova Aguila

Company:
Elo Indústria e Comércio de Correias Ltda.

Approved value:
Phase 1: R$ 69,117.84

In the textile branch of industry it is common to use movement transmission belts in the looms, reels and thread spindles. The substantial friction generated when working causes an accumulation, on the surface of the belt, of particles of dust, thread fibers and many other non conductive light-weight materials. This build-up, in time, ends up increasing the thickness of the belt, leading to alterations in the speed of the system. Owing to the decrease in the friction coefficient of attrition between the pulleys and the belt it frequently happens that that whole drive mechanism becomes paralyzed. There exists on the Brazilian market an imported belt with which, possibly because of the use of antistatic agents, this problem does not occur. ELO developed a similar national product with mechanical properties equivalent to that of the imported belt at a much lower cost. An efficient alternative to be developed in this project is the application to the belt of layers of composites containing charge conductors. The technology involves the development of formulations of composites and in the application process to be used on the production line. A layer of conducting composite containing high conductivity lampblack will be applied between the inner layer and the outer layer, which offers the high resistance to abrasion necessary for high durability. The external layer will avoid the build up of electrical charge on the belt and the mechanical properties of the belt will be maintained.

435 Development of a Temperature Supervision System for Productive Sectors of Red Ceramic

Coordinator:
José Antonio Armani Paschoal

Company:
Flyever Indústria e Comércio de Equipamentos Eletrônicos Ltda.

Approved value:
Phase 1: R$ 68,168.50

This proposal is aimed at the research and development of temperature supervision for kilns and drying chambers (ovens) in red ceramic industries (blocks, floor tiles, roof tiles and ceramic pipes). It is intended, in this way, to achieve an improvement in quality, a reduction in cost and the training of professionals in this type of industry. The project will consist of: 1) microprocessed digital temperature indicators and controllers with serial communication and via radio frequency; 2) serial communication units via radio frequency for the collection and sending of data; and 3) supervision software for the monitoring and control of firing and drying of the material (clay), collection of data and formulation of technical guidelines for quality. The implementation of this project requires field work with research in different localities, since ceramics activity is present throughout the country. In this way it will be possible to become acquainted with particular methods of every region, which should lead to a standardized system which optimizes the production process. The option for sending data via radio signal makes the installation, the operational control and maintenance of the system more practical.

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