# Activity Report 2007-2010



RESEARCH AND TECHNOLOGICAL DEVELOPMENT FOR INNOVATION



National Institute of Technology 

Ministry of Science and Technology

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### Presentation

The period from 2007 to 2010 coincided almost totally with the management of the current direction of the National Institute of Technology (INT/MCT) (Instituto Nacional de Tecnologia) as we took over in May 2007 as a result of the Search Committee process, a practice adopted by the MCT. The Management Project I presented at the time was based on the following goals for the Institute:



- To value its intelectual capital, main factor of its differentiation in the generation of its knowledges;
- 2. To expand its performance in a network with the divers life forces of society;
- 3. To build different innovation trajectories based on new forms of relationships with institutions, industries and government agencies, and
- 4. To use mechanisms available to the community of science and technology in order to lever a new dynamics of innovation for the country.

This period of time corresponds to the second term of President Luiz Inácio Lula da Silva and to the term of the Minister of Science and Technology, Sérgio Rezende, which began in July 2005 and ended on December 31st, 2010. In terms of the C,T&I policy, it was an extremely advantageous period, marked by planning and by the increase in investments in areas that are strategic for the country development. It is worth noting that the definition of the Action Plan 2007-2010 by the MCT served as a guideline to the INT performance.

In this context, the Institute had an important time, one of expansion and consolidation of expertises, with significant investments from partnerships and

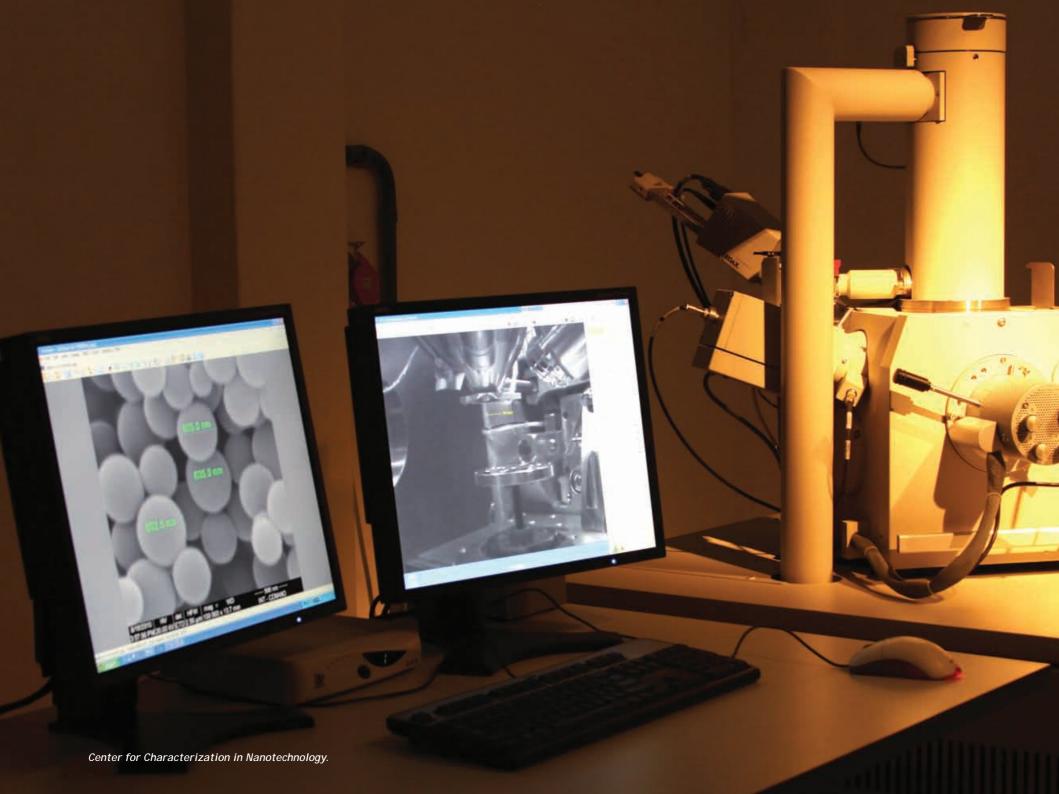
projects deriving from the expansion of the oil and gas sector, assured by the investment clause of the National Agency of Petroleum, Natural Gas and Biofuels (Agência Nacional do Petróleo, Gás Natural e Biocombustíveis - ANP) and leveraged by important partnerships, led by Petrobras. From other ministries, Government sectors, companies and third sector also emerged several demands that marked a major interaction of the INT and MCT with society.

Internally, strategic partnerships were also intensified through the important exchange of experience based on the meetings of the Technical and Scientific Council (Conselho Técnico e Científico) (CTC / INT), that assembled representatives of institutions like the MDIC, BNDES, Petrobras, Fiocruz, USP and Firjan, besides those of the INT personnel and directorate.

In the context of the management process, remarkable projects have been implemented such as the revision of the Internal Congress methodology, the creation of the Annual Meeting for the Results Evaluation and, most importantly, the beginning of the Management Project for Strategy Directed to Results, which plays a significant role in structuring a new management format, listing strategic areas of action and generating a major synergy between the technical and administrative areas, all directed to the organization's results.

Moreover, we also record the expertise and the knowledge accumulated in several areas of the INT, which, together with the dedication of its personnel, form the major asset of the Institution, supporting the results presented in this report.

At last, we observe that the management stage recorded in this document (2007/2010) will be completed at the end of May 2011 when the Search Committee, already installed, will submit a triple list of candidates to the current Minister of Science and Technology, Aloizio Mercadante, from which he will choose the director of this Research Unit. What we expect, then, is that the C,T&I development project continues to progress, with the INT participation, thus effectively contributing to the nation development.



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### Introduction

# National Institute of Technology: technology and innovation since 1921.

The National Institute of Technology (INT) is a multidisciplinary institution that since its creation in 1921 dedicates its activities to the development of industrial technology with a performance based on national programs and strategic actions. It presents 89 years of a remarkable performance in research, services, human resources training and creation of institutions and companies that contributed to the shaping of the National System of Science, Technology and Innovation which nurtures the Brazilian process of technological and industrial development.

The INT is a unit of research which integrates the structure of the Ministry of Science and Technology (MCT), as issued by the Decree no. 5886 of September 6th, 2006, and its headquarter is located in the city of Rio de Janeiro, RJ. It also has a Unit in Northeast Brazil called Center for Strategic Technologies of the Northeast - Cetene (Centro de Estratégicas Tecnológicas do Nordeste).

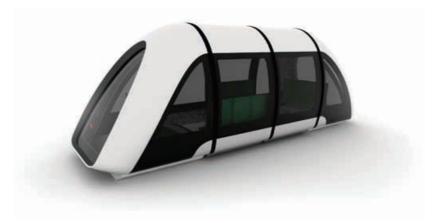
Regimentally, the INT aims to promote, develop and execute research, focusing on transfer of technology to society, as well as to provide specialized technical services and the training of human resources, with emphasis on innovation. In order to perform its activities, the Institute has in its structure the following hierarchy levels: a director, a general coordinator, 19 chiefs of division, four chiefs of nuclei, four chiefs of section, two chiefs of sector and a chief of service.

It also has the Technical Scientific Council (CTC) in its structure, with the function of guidance and assistance to the director in the planning of technological activities, and its performance is regulated by a statute.

The actions of research, development and innovation, industrial technology and technological services conducted by the Institute have been consolidated through the interaction with divers actors of society: industrial enterprises as well services enterprises, government agencies, normative entities, research Institutes, universities and individuals. New sources of revenue, rendered

possible by the MCT itself through both the National Agency for Financing Studies and Researches (Finep) and the Funds Sector, were also vital for the Institute's achievements.

This report presents the INT achievements in the period from 2007 to 2010, a result of the strategic management based on the Master Plan and on the Plans of Action of the Federal Government, mainly the 2007/2010 Action Plan of the MCT, the *More Health* Program (*Mais Saúde*) of the Ministry of Health; the programs on *Energy* in the Ministry of Mines and Energy; and the Productive Development Policy of the Ministry of Development, Industry and Foreign Trade.



The prototype of the Maglev Cobra vehicle: Project of Coppe / UFRJ designed by the INT.

## Timeline: 1921 to 2010

Next, the 89-year trajectory of the major results achieved by the INT.

1920's	1930s	1940s
<ul> <li>Creation of the Experimental Station of Fuels and Minerals (EECM), today the National Institute of Technology (INT).</li> <li>Pioneering research: the EECM alcohol car runs, in 1925, the distance Rio/São Paulo.</li> <li>Study on the use of limestone containing magnesium in cement manufacture.</li> </ul>	<ul> <li>The Experimental Station of Fuels and Minerals becomes the INT (1934).</li> <li>First case studies for the use of charcoal, which ended the import of this mineral by the domestic steel industry.</li> <li>The President, Getúlio Vargas, visits the INT headquarters.</li> <li>Analyses performed by the INT confirm the existence of oil in Lobato, Bahia.</li> <li>Pioneering work: The INT uses vegetable oils to replace diesel oil - castor oil, palm oil, babassu oil, peanuts and cotton.</li> </ul>	<ul> <li>Creation of the test method for concrete resistance - Brazilian Test.</li> <li>Creation, by the INT Division of Construction Industries, of the Brazilian Association of Technical Standards - ABNT (Associação Brasileira de Normas Técnicas).</li> <li>During the Second World War, the Institute uses syngas as a substitute for gasoline.</li> <li>Assembly of central power plants to obtain anhydrous ethanol (States of Rio de Janeiro, Min Gerais and Pernambuco).</li> <li>Studies of essential oils (peppermint, copaiba, vetiver, rosewood, sassafras), aiming exportation</li> </ul>
Agosto de 1925  Agosto de 1925	The INT building, built in the Docklands/RJ; oil samples	The 'Brazilian test' and its creator, Fernando Lobo

### 1950s 1960s 1970s Introduction of the chromatography Creation, at the INT, of the first Centre for Creation of the first center for Design in technique in Brazil. Technological Information in Latin America. a federal institution, now the Division of Industrial Design. Studies of Biotechnology and Termination of the INT Metrology Division, Participation in the preparation of the beginning of the National Institute of Environmental preservation. Alcohol Program (Proálcool - Programa Weights and Measures (INPM) (Instituto Nacional do Álcool). First study of corrosion under stress in Nacional de Pesos e Medidas), current Brazil, conducted by the INT Laboratory The INT participates in the construction Plant Inmetro. of Metallography. of cassava ethanol of Curvelo, Minas Gerais. The INT study Group on Industrial Pollution prepares the Technological Program for Prevention of Industrial Pollution. View of the INT Library, headquarter of the Centre The facade of the INT old building. Vegetable oils are laboratory tested. for Technological Information.

### Timeline: 1921 to 2010

 Accreditation, by the Inmetro, of the INT first laboratory - Mechanical Testing.

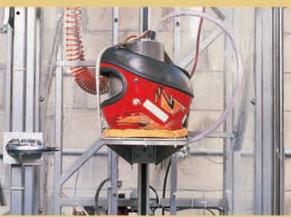
1980s

- The INT absorption of groups of the Foundation for Industrial Technology (FIT).
- Beginning of studies related to biomass hydrolysis to obtain alcohol.
- The INT Laboratory of Ergonomics leads an anthropometric survey of the Brazilian population.
- Development of a process for obtaining CMC
   carboxy methyl cellulose, with transfer to Petrobras supplier industry.
- Pioneering studies aimed at adding alcohol to diesel oil, with the creation of biodiesel.

### 1990s

- The Division of Technological Information and Prospecting presents an outstanding performance in competitive intelligence.
- The Division of Industrial Design initiates the rapid Prototyping service in Brazil.
- Creation of the INT business incubator.
- Innovation in management through the implementation of the matrix of production indicators.

- The beginning of the Specialization course in Production Management.
- Early studies on mixed fuel (ethanol/ diesel) at the INT.
- Introduction of the Sharing Skills Program.



Helmet test at the Laboratory of Mechanical Testing, current Laboratory of Products Testing.



Bus tests the INTol mixture as fuel.



The rapid prototyping system is used at the Laboratory of Tridimensional Models in the area of Industrial Design.

### 2000

- Participation and coordination in networks (Sibratec).
- Actions addressed to the popularization of science, technology and innovation.
- Leadership in the area of product evaluation in Health sector.
- First federal institute to be accredited as a Product Certification Body (OCP 023).
- The INT inaugurates the Laboratory of Combustible Gases.
- New technologies for hydrogen production from renewable raw materials such as ethanol, and glycerol co-produced with biodiesel and bio-oil.

- Creation of the Committee of Innovation Management.
- Strengthening of the performance in the development of social technologies.
- Early studies on Nanotechnology.
- Incentive to the patenting of new technologies aiming the transfer to the productive sector.
- Implementation of the Law of Innovation, under the rules of the INT Innovation policy, with actions such as innovation fellowships and royalty payments.
- Creation of the Center for Technological Innovation.
- Use of waste rock in mortar generation: technology transferred to the factory in Santo Antônio de Pádua, RJ.
- Creation of the Technology Center of the Northeast (Cetene).

- Review of the methodology of the INT Internal Congress using the BSC tool.
- First contract for transfer of technology patent of the hardness standard block.
- Inauguration of the Laboratory of H2S, CO2 Tests and Corrosivity.
- The INT Catalysis Group is considered one of the best in the world.
- Biocorrosion projects in pipeline, in partnership with Petrobras.
- Creation of the Centre for Nanotechnology Characterization (Cenano).



Special steels are tested in the Laboratory of H<sub>2</sub>S, CO<sub>2</sub> and Corrosivity.

Laboratory of Combustible Gases supports the use of Natural Gas.

Tridimensional model of the mummy "The Beauty of Thebes."

Opening of the Argamil mortar factory in Santo Antônio de Pádua/RJ.



### INT Results: MCT action plan

In order to present the INT achievements in the period 2007-2010, we used the structure of the Action Plan 2007/2010: Science, Technology and Innovation for National Development.

The plan aimed the definition of a wide range of initiatives, actions and programs which will allow a more decisive role of science, technology and innovation (C,T&I) in the sustainable development of the country.

The plan priorities are directly related to the four strategic axes that guide the current C,T& I National Policy:

- Expansion and Consolidation of the C, T&I National System (SNCTI), working together with the state governments to expand the national scientific and technological base;
- II. Promotion of Technological Innovation in enterprises;
- III. Research, Development and Innovation in strategic areas for the country sovereignty, especially aerospace energy, public security, national defense and the Amazon, and
- IV. Science, Technology and Innovation for social development through the promotion of science popularization and dissemination of technologies in order to improve the living conditions of the population.

Next, we highlight the major INT outcomes related to each of the four strategic axes.

# Expansion and consolidation of the C,T&I national system

### Expansion and institutional consolidation

Through the legal framework of the National Fund for Scientific and Technological Development (Fundo Nacional de Desenvolvimento Científico e Tecnológico - FNDCT), there was an important advancement in the regulation of the National System of Science, Technology and Innovation, which won mechanisms that made more flexible and facilitated the participation in projects with the development agencies.

The construction of thematic networks was another crucial action. Networks linked to Sibratec ensured the possibility of advancement related to specific strategic objectives, such as Health, Biofuels and Hydrogen. The Ministry of Science and Technology was the major developer of these networks which presented a large number linked to Petrobras and to the chain of Gas and Oil, having the INT participated in a considerable amount of them in this period.



Biofuels: storage tests at the Laboratory of Corrosion and Protection.

### Formation and Training of human resources for C,T&I

The INT has put into practice such goals as: to increase the number of training, research and extension grants awarded by CNPq, with a focus on engineering and priority areas of the MCT Action Plan 2007/2010, *More Health* Program/MS, Programs in Energy of the MME and the Productive Development Policy/MDIC; to favor the insertion of researchers in enterprises aiming to induce the birth of structures of P, D&I business; and to promote the expansion and qualification of the professionals involved in research, development and innovation activities.

From 2007 to 2010, the INT has added to its workforce 100 fellows who had the opportunity to expand the training, through participation in projects of the Institute.

It is worth noting that many of these fellows, after the expiration date of the grants, were and are hired by enterprises, which demonstrates the importance of the activity in the training of human resources. In this report, in the item *INT in numbers*, are the details of the evolution of the Institute fellows.



Laboratory of the Evaluation of Hospital Medical Articles.

## Infrastructure and promotion of scientific and technological research

In the period 2007-2010, the INT significantly expanded its laboratory infrastructure, favoring its performance in strategic areas. With the expertise and efforts of the teams affiliated to the programs of development and with the support of MCT, we completed 2010 with 189 projects in P, D&I, mostly related to technological innovation at enterprises. This portfolio amounts to around 25 million reais\*, of which 8.8 million are coming from the investment clause of the ANP, covering topics such as bioethanol, biodiesel, hydrogen, energy conservation, nanotechnology, design, evaluation and certification of products, materials and engineering. It is also worth noting the record of the ongoing actions aiming to increase the integration of the INT areas on strategic issues, thus optimizing its infrastructure through the sharing of equipment and personnel.



The Division of Analytical Chemistry was one of the beneficiaries of reforms and new equipment.

Several actions were undertaken during the period, expanding, restoring and modernizing the headquarters of the INT, its laboratories and other areas. Their objective was to equip the institution to meet its current needs, aligned to forecast technological growth. Investments were made in construction, renovations, improvements and modernization of

laboratory facilities in the order of \$ 5.4 million. Among these actions we can highlight:

- reforms in the laboratories of Analytical Chemistry, Corrosion and Degradation, Mechanical Testing, Characterization of Mechanical and Microstructural Properties, Fuels and Lubricants and Catalysis;
- retrieval and exchange of the entire roof of the INT with the use of internal space to expand the area for the Directorate and its Coordinations;
- reform of the laboratory area and creation of the Laboratory of Tobacco;
- reform of administrative areas for allocation of the divisions of Certification, Production Management, Quality Management, Budget and Finance:
- reform of the elevator, giving another automated elevator to the institution;
- construction of several gases stations for the laboratories;
- reform of the INT's refectory;
- project of the electric revision of the entire electric power grid of the building;
- construction of the Center for Nanotechnology;
- recovery of the internal drainage system of the INT, and
- reform on the 4th floor of the building, in the facilities for events.

Still in the scope for expanding the installed capacity and infrastructure, The INT highlights the following projects:

Investment of \$ 1.5 million in actions directed exclusively to security
in building installations and facilities common to all laboratories:
installation of a network of sprinklers in the main building; installation
of heat and smoke sensors in all the surroundings; improvement of the
electrical facilities through the modernization and interconnection of all
the switchboards of light and power of the INT to the network ground;
improvement of the accessibility to the floors of the main building

through the modernization of elevators; installation of a new network of compressed air for the laboratories; expansion and modernization of the logistics and stabilized network to meet the interconnection of equipment and the increase in the speed of data transmission; implementation of actions aiming an appropriate treatment, management and disposal of the chemical waste generated by the laboratories; unification of warehouses with adequate facilities aiming the improvement of the process of storage and distribution of the products used in the laboratories, with the consequent optimization of the physical space.

The establishment of networks and partnerships with research centers and groups which have facilities of interest to the INT was important to optimize the use of the facilities necessary for the Institute performance. A constant concern was not to duplicate the physical facilities already available in other ICT's and to create multiuser laboratories. Besides, this measure consisted in an alternative to deal with one of the major limitations of the unit, its reduced personnel.

### Promoting innovation in enterprises

### Sibratec

The INT has a performance linked to the Brazilian System of Technology (Sibratec), established in November 2007 to meet the goals of the *Plan of Action for Science, Technology and Innovation for National Development (Pacti 2007-2010)*. The Institute integrates the three categories of the Sibratec networks: *Technological Extension, Centers for Innovation and Technological Services*.

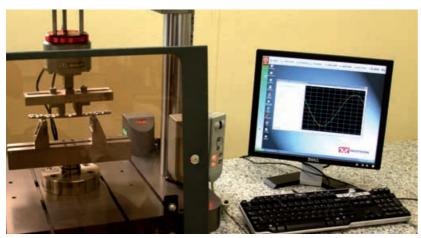
At the regional level, the INT coordinates, since its beginning in 2009, the State Network of Technology Extension of Rio de Janeiro, and also acts as co-executor of the Mato Grosso network. It assists the Mato Grosso do Sul network, besides participating in a work group installed by the MCT which aims to propose the homogenization of types of technological cares to be practiced by all existing networks in the 26 states of the federation.

In the Sibrated Extension Network/RJ, installed after the approval by Finep of the project of *Implementation of the Technological Extension Network of Rio de Janeiro to support the micro, small and medium enterprises* and the financial contributions of local partners, extension services and technological assistance are offered. The network began to encourage innovation through the solution of technological problems, adjustment of products and production processes, pre-qualification for certification, aiming exportation, in divers sectors.

The service also has two mobile units for specific services for the food sector, located in Sibratec/Vassouras, and another unit for processed plastic products at the INT. This action has the shared governance between the Institute, Redetec, Sebrae/RJ and Faperj.

The INT also assumed the overall coordination of two out of the 19 thematic networks of Sibratec Technology Services: Products for Health, which aggregates 46 laboratories and started its work in 2010; and Biofuels which will have 21 laboratories in 2011. The Institute also participates in the TIC Network - Products and Electronic Devices.

In the Sibratec Innovation network, the Institute participates in the Networks of Plastics and Rubber, Bioethanol/Enzymes and Capital Goods, all still in an ongoing installation.



Orthopedic prosthesis is evaluated in fatigue resistance test, at the Laboratory of Evaluation of Hospital Medical Articles.

### Innovation Policy

Driven by the Law of Innovation, the INT had as one of its strategic goals in the period 2007- 2010 to strengthen the Center for Technological Innovation. Aiming to achieve this goal, some actions were undertaken during this period, foremost among them the allocation of places in a public contest in 2008, the establishment of a coordination and a division directed to inovation management, from 2009 onwards. In this context, today, the competences of the Center for Technological Innovation are practiced by the Regional General Coordination in Rio de Janeiro and the Division of Innovation and Technological Prospection, through the Section of Intellectual Property and Innovation and of the Section of Transfer and Technological Cooperation.

As a result of all this effort and by the performance of its Center for Technological Innovation, the INT had, between 2007 and 2010, unprecedent results in its history in number of patent applications. Twenty-eight deposits were made in Brazil at the National Institute of Industrial Property (INPI) and seven international patent applications, besides four applications for registration of trademarks.

In 2008, we can point out the performance of the mixed contract to supply technology and operating license patent agreement with the Argamil enterprise, regarding the PI0205481-7 patent application entitled *Process for the separation of fine solids and their use in mortars for construction.* This patent application is held by the INT and the Center for Mineral Technology (Cetem).

In 2009, the INT becomes part of the project called Arrangement of the Technological Innovation Centers of Research Units of the MCT in the State of Rio de Janeiro, which aims to consolidate the implementation of the Law of Innovation in the institutions through the integration of their INT's in order to disseminate their experiences and integrate activities related to the Intellectual Property and Transfer of Technology. Besides the INT, the arrangement comprises the Brazilian Center for Physics Research

(CBPF), the Center for Mineral Technology (Cetem), the Institute of Pure and Applied Mathematics (Impa), the National Laboratory for Scientific Computing (LNCC), the Museum of Astronomy and Related Sciences (Mast) and the National Observatory (ON).

Another highlight in 2009 was the fact that the INT was aknowledged by the Latin American Faculty of Social Sciences (Flacso), which evaluated 32 institutions of Science and Technology in Brazil, Chile and Mexico, the institution with the best practice in transfer and the best technological partner. As an intergovernmental agency established by UNESCO, Flacso assessed knowledge management, identification of intellectual assets, projects management, knowledge mapping and competitive intelligence, the portfolio of technology services, the management of intellectual property and the transfer results to society. An important aspect of this classification is the possibility of a closer approximation and dissemination of the INT with the countries of Latin America and the Caribbean, since Flacso, organizer of the Project, currently includes 17 countries, in addition to having 12 academic units.

Regarding implementation of the benefits under the Law of Innovation, a relevant point was the publication, in 2009, of the INT Innovation Policy and the preparation of seven Quality Procedures in order to regulate and define the submission of Projects of Technological Innovation. Among the procedures are:

- Project of Technological Innovation (PTI);
- Payment of Remuneration to the Creator (royalties);
- PTI of the Agreement of Cooperation and Exchange of Stimulus to Innovation;
- PTI of Provision of Services and Additional Variable
- Management Committee on Innovation;
- Facilities Sharing and
- Independent Inventor Care.



The technologist José Carlos da Rocha displays his first paycheck with the credit of innovation royalties received by a civil service employee of the MCT.



The number of patent letters has increased considerably after the new Innovation Policy, which regulates the Law of Innovation in the INT.

The transfer of technology also presented a remarkable fact at the INT in 2009. For the first time, a server of a research unit of the MCT received directly from the public coffers the royalties from the sale of a technology to a private company. Result of the Law of Innovation, the invention was developed and patented jointly with the Center for Mineral Technology (Cetem/MCT) and promoted the use of ornamental rock waste in mortar production.

The elaboration of the procedures mentioned also provided, in 2010, the implementation of the Managment Committee on Innovation which aims to assist the Direction in making decision on the approval of the Projects of Technological Innovation. Another important development regarding the implementation of the instruments of the Law of Innovation was the Grant to Encourage Innovation. The incentive was awarded to two INT researchers through a research project in partnership with Petrobras to develop an innovative process for generating chemical intermediates from biomass.

The Projects of the Law of Good (Lei do Bem) are incorporating into the INT a new methodology of analysis and a new technical service, especialized in identifying and qualifying processes and innovative content products generated in the implementation and production of products, services and new processes, or processes improved by enterprises so that these can benefit from tax incentives which the Law No. 11,196 - Good Law grants.

In 2010, together with the INTRIO arrangement, the INT actively participated in the studies and preparation of the Innovation Policy of the MCT, whose overall objective is to establish the Institutional Policy of Innovation and Stimulus to the Protection of Intellectual Property to be followed by the Research Units of the MCT, promoting coordinated actions with regard to the application of instruments for innovation, observing the guidelines of the Plan of Action - Science, Technology and Innovation for National Development of the MCT.

### Extensionism

Since 2001the INT leads the special programs for technical assistance to micro, small and medium enterprises in Rio de Janeiro, from fundings provided as subsidy by Finep.

This is the case of the Technological Support Program for Export (Progex), sponsored by the MCT and MDIC involving Camex, Finep and Sebrae. The program has been providing technological assistance to micro, small and medium enterprises in order to assist them to become exporters and to improve their performance in foreign markets. In Rio de Janeiro, through the INT, the Progex-RJ technologically adjusted, between 2001 and early 2010, products of 209 enterprises, making them competitive in foreign markets.

Relying on a team of technological extensionists and on the structure of the INT and on that of its public and private partners, the program has had an outstanding performance in the interior of Rio de Janeiro, especially in the sectors of clothing and organic foods, contributing greatly to the growth of the economic activity in the state, strengthening its internalization and the insertion of Brazilian products abroad. The Progex-RJ laid the Foundation of a strong network of support to micro, small and medium enterprises including funding, as well comercial sources, beyond those of a technological nature.

The Program, established in three stages, is being increasingly incorporated into activities of the Extension Technology Sibratec Network/RJ, which has been coordinated by the INT since its beginning in 2010. The network serves both the aspect of technological adjustment of products and production processes aiming exportation, as it adds an itinerant technology assistance to food and processed plastics enterprises addressed to improve competitiveness, with impacts on the domestic market. Moreover, the Program started to encourage in the companies a culture of innovation, a greater access to knowledge and technological infrastructure, and to the development of products and systems of production organization.

Another service provided by the INT was the Project of Mobile Units (Prumo), which offered specific technological assistance to micro and small enterprises of plastic processing in Rio de Janeiro. With funding support from FINEP and Sebrae/RJ, the assistance has adjusted the enterprises to procedures standards, reducing production costs and losses of raw materials, besides improving the

products quality, increasing the productivity and competitiveness of these enterprises. The partnership with the productive sector was also intensified through the provision of specialized technical services, such as the Mobile Unit Service Assistance to the Sector of Processed Plastics, which, in 2007, visited 12 municipalities in Rio de Janeiro and nearly 40 enterprises of which 80% were small or micro ones.

### **Product Certification**

The Body of Products Certification (OCP 0023, INT) received from Inmetro, in the period 2007-2010, an extension of its scope to carry out the certification of two new products: sugar cane and surgical gloves and gloves for non-surgical procedures. The INT had already certified products such as condoms, safety matches, protection helmets for occupants of motorcycles and the like, besides plastic packaging of up to 5 liters for alcohol canning.

The compulsory certification of surgical gloves and gloves for non-surgical procedures was established by Inmetro Ordinance No. 233 of 06/30/2008, considering the Resolution No. 5 of 2008 of Anvisa, the Regulatory Standard No. 6 of the Ministry of Labor, and Standards of the ABNT. From then on, it was mandatory to control the quality of gloves on the market, which are regulated by the Ministry of Health, as well as other products that affect health and the consumer safety. The manufacturer must meet the standards established in the Inmetro certification process. The INT, as OCP0023, has been certifying factories of surgical gloves and gloves for non-surgical procedures, established in Brazil and abroad.

Nevertheless, the certification of cachaça (rum) at the Institute, was initiated in December 2009. The certification of such products is voluntary, as established by the Ordinance No. 276 of 09/24/2009 of Inmetro, which approved the regulation on the Evaluation of the Conformity of Cachaça. The INT, as OCP0023, held, in 2010, the first certification of an alembic in Rio de Janeiro.

Desempenho



Segurança



Saúde



### Identification of Conformity Stamps

### Incubator



Built in 1999, the INT Business Incubator graduated nine enterprises, five in the period between 2007 and 2010: two in 2007 and three in 2010.

In the period, the enterprises aimed to transfer to society the technologies developed at the INT. The graduate enterprises have developed machines and software for cyclic tensile tests, tests for the diagnosis of environmental pollution, a system for the ergonomic analysis of products, products for sustainable home automation, and a management system of production for the clothing industry.

From 2010 onwards, with the support from FAPERJ, through the Official Public Announcement of Support for Technology-Based Business Incubators in Rio de Janeiro, resources of around R\$ 120,000 were transferred to the INT for the modernization project of its Incubator which underwent a reform aiming to enlarge its physical capacity to incubate eight new companies.

The INT incubator is also qualified to establish the Center of Reference to Support New Enterprises (Cerne), by Anprotec. The project aims to promote an expressive improvement of the results of the incubators of different areas, both in quantitative and qualitative terms. The objective of Cerne is to create a platform of solutions in order to expand the incubator capacity to systematically generate successful innovative ventures.

In October 2010, it was opened the Official Public Announcement No. 01/2010-2014 for the selection process of new ventures based on innovative technologies.

# Research, development and innovation in strategic areas

### Nanotechnology

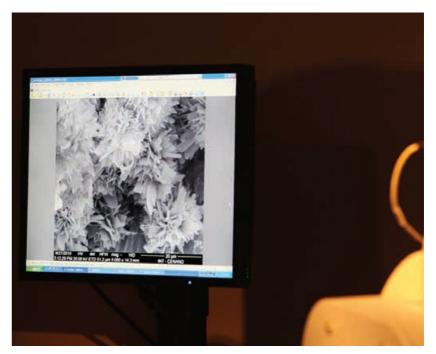
In the period 2007-2010, The INT intensified its studies on nanometer dimensions (100 - 100 nm). Within this context, and focusing on technological innovation, four technical areas used nanotechnology to perform, partially or totally, its works: Essays on Materials and Products, Corrosion and Degradation, Catalysis and Chemical Processes, and Processing and Characterization of Materials.

Marking the strategic importance of the theme at the Institute, the Center for Nanotechnology Characterization was inaugurated on November 22nd, 2010. In this space, which greatly encourages research involving nanometric dimensions, the equipment crucial to the theme was installed, such as scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS). For 2011, we aim to acquire two transmission electron microscopies (TEM), which will complement the

laboratory complex of Cenano.

The coordination of the physical-chemical actions is now led by a Management Group with monthly meetings which promote lectures, approaches to enterprises, interactions with universities, the definition of priorities and prospective researches. The group includes high level researchers, mostly with doctorate, master and specialization degrees in different areas of knowledge such as: polymeric materials, ceramic materials, biomaterials, heterogeneous catalysis, corrosion and microstructural evaluation.

The INT also participates in the Competitiveness Forum on Nanotechnology, coordinated by the Ministry of Development, Industry and Foreign Trade



The scanning electron microscope (SEM) amplifies the image up to one million times, supporting the INT works on nanotechnology.

(Ministério do Desenvolvimento, Indústria e Comercio Exterior - MDIC), integrating the Labor Market Group. An extensive document on the Nanotechnology market, entitled Activity Report 2009/2010, was developed by the group and posted on the MDIC website.

Below are cited a few examples of projects in nanotechnology, in progress at the INT:

- Nanotopography study of the surface of titanium to optimize the biocompatibility of surgical implants Health Sector.
- Deposition of bioceramic coating on titanium for use in surgical implants -Health Sector.
- Development of metals with nanometric crystalline structure with angular extrusion Metal-Mechanical Sector.
- Commercially pure titanium: development of nanostructured titanium for orthopedic applications in surgical and dental implants - Health Sector.
- Obtainment of ceramic nanomembranes for use in ensuring the quality of drinking water - Chemical Sector - industrial use.
- Development of uni and bidimensional nanostructured catalysts (nanotubes of oxides of transition and nanosheets) Petrochemical Sector.
- Development of transition-metal mixed oxides nanocatalysts to obtain acrylic acid from propane Petrochemical Sector.
- Hydrogen production from ethanol, using nanoparticles supported on carbon nanofibers Renewable Energy.
- Production of aerosols with bioabsorbable nanoparticles containing tuberculostatics for treatment of tuberculosis Pharmaceuticals.

- Obtainment of nanocomposites from polymeric blends and organophilic clays
   the development of thermoplastic elastomer-nanocomposites Chemical Sector - industrial use.
- Obtainment of Al2O3-SiC ceramic composites (nano) aiming structural applications of high performance Chemical Sector industrial use.
- Obtainment of polymeric nanocomposites from polypropylene and lamellar double hydroxides - Chemical Sector - industrial use.
- Modification of clays with phosphonium organic salts and development of nanocomposites with polyamide 6 - Chemical Sector - industrial use.

### Health

The INT began operating in the Health Area at the late 1980s, analyzing premature failures of orthopedic implants in patients from the public sector in the State of Rio de Janeiro. From this demand, the Institute launched a partnership with the Ministry of Health and agencies responsible for large purchases of implants, providing technical assistance and improving the public bidding documents with specifications that allowed the government to buy large lots with less risk.

Since then, the INT has expanded its infractructure of technological services to meet this and other demands. It consolidated its performance in forums on standardization and technical regulation and started to evaluate the conformity of dental-medical-hospital products. Male condoms, surgical gloves, gloves for non-surgical procedures, orthopedic implants, surgical instruments, bottles and pacifiers are now under its scope of evaluation.

In the context of network performance, the INT integrates the Laboratory of Biomaterials of the MCT Research Units (Labiomat/MCT) at the Brazilian Center for Physics Research (CBPF), the Center for Mineral Technology (Cetem) and the Center for Information Technology Renato Archer (CTI),

besides actively participating in the consolidation of the Multicentric Network of Orthopedic Implants Evaluation (Remato) which comprises 13 research institutions and universities, performing technical leadership in partnership with the National Institute of Traumatology and Orthopedics - Into.

In August 2008, the Institute inaugurated the Laboratory of Evaluation of Medico-Hospitalar/Implants Articles, reinforcing the importance of evaluating products for healthcare sold in the country.

In 2008, it joined the Iberoamerican Network for Biomanufacturing: Materials, Processes and Simulation (Biofab), belonging to the Programa Iberoamerican de Ciência Y Technology para el Desarollo (Cyted), which comprises 20 research groups from seven countries.

Finally, in 2009, the INT was chosen to assume the General Coordination of the Sibratec Network Technological Services - Products for Health Care (ProdSaúde). The network was structured with four subnets: Implants, Orthotics and Surgical Instruments, Medical-Hospital Articles, Medical Electrical Equipment and Supplies for Dialysis, aggregating 17 institutions, with 35 laboratories in the South, Southeast, North and Northeast regions.

Next we highlight some of the consolidated products and processes by the INT in the Health Area:

- Male condoms.
- Evaluation of conformity certification of health products.
- Nanostructured titanium for surgical implants.
- Deposition of bioceramic coating on titanium by magnetron sputtering process.
- Surgical implants manufactured by rapid prototyping.

 Tridimensional physical models of fetuses in the womb, using rapid prototyping technologies from archives of medical images (magnetic resonance, computed tomography and 3D ultrasound).



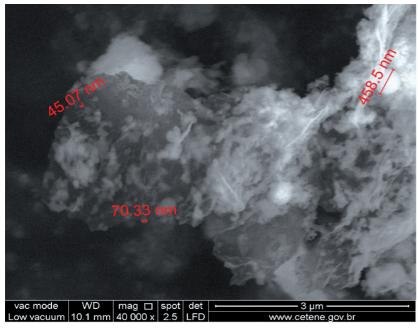
Model from 3D ultrasound combined with MRI.



Model constructed from computed tomography.

- Aerosol production for the effective treatment of tuberculosis.
- Organic composite membranes for use in renal replacement therapy (hemodialysis).

- Segmentation and construction of models of the body internal organs with magnetic resonance imaging and computed tomography (256 channels).
- Analysis of the composition of cigarettes, contracted through a cooperation agreement with Anvisa/MS, which will culminate with the performance of the new Pilot Laboratory of Control of Tobacco Derivatives.
- Alginate nanoparticles of zinc to fortify foods.



The MEV image shows details of agglomeration of nanogel alginate zinc particles used in food fortification.

The INT, when establishing the area of Health as one of its major strategic focuses, has become a benchmark for the development of technologies and strategic services to the industrial complex of Health, government agencies, and other renowned institutions in the area, such as Fiocruz and Into.

### Biofuels - Biotechnology

In the area of biofuels, the INT has had different technological development activities, participating in the National Biodiesel Program as part of the Brazilian Biodiesel Technology, coordinating two thematic groups. One, addressed to characterization and quality control, is managed by the Energy area, and was responsible for drafting a project of instrumental training for the laboratories involved.



Biodiesel is produced in an INT pilot plant.

The other thematic group coincides with the Network of Studies and Projects on Biodiesel Storage. This participation included the Finep project Research and Characterization of Biodiesel and the deposit of the application for an invention patent (PI0703303-6) under the title Process for Obtaining Biofuels for Vehicle and Stationary Diesel Motors, in addition to laboratory prospective studies on the evaluation and composition of mixed diesel/biodiesel from palm oil and beef tallow (binary) and ternary with an added third component.

In another area, the area of Catalysis and Chemical Processes, the INT has developed new technologies for the production of second generation ethanol from the biochemical processing of cane sugar bagasse and straw, in addition to new catalysts for converting ethanol into hydrogen and other fuels with higher productivity and lower environmental impact.

In the project *Bioethanol - Ethanol Production by Enzymatic Hydrolysis* of Cane Sugar Biomass (bagasse and straw), the INT was inserted in two areas: production of enzymes (obtaining sophorose from glucose) and development of technology for pre-treatment and hydrolysis of biomass (pre-treatment with steam).

Through the Brazil-France international cooperation agreement, the INT also worked on the study and classification of different families of heterogeneous catalysts used in the transesterification reaction with ethanol, castor oil, and palm oil. The same agreement, initiated in 2007, promoted the study of the characterization of nanostructured catalysts used in biomass and fuel processings.

In agreement with Uruguay, the INT contributed to the implementation of the project of production and use of biodiesel in the administration of Payssandu, providing assistance and technology consulting.

In partnership with the domestic industry, the Institute has conducted studies on the certification and quality of biodiesel and its blends with Diesel oil, according to the ANP resolution No. 42 of 11/24/2004 and No. 15 of 07/17/2006. The Institute also offered technological assistance and extension to the production and use of biodiesel.

In 2008, the INT initiated studies for Petrobras aiming to verify the presence, in all types of biodiesel marketed by the company, of microorganisms which might potentially cause biocorrosion. It also conducted studies on corrosion by alcohol for the company that manufactured the tanks for vehicles.

In the same year, the Institute supervised all the stages of biodiesel production, guiding the experimental production of biofuel in the South

and in the Metropolitan areas of Rio de Janeiro. The activities involved the establishment of units of oilseed cultivation, extraction of vegetable oils, and biodiesel production at the INT facilities, and tests of Quality validation.

The INT also worked in the establishment of the Network of Studies and Projects on Biodiesel Storage within the scope of the Technology Network of Rio de Janeiro, which it now rules. The group studied solutions for storage problems, corrosion and degradation of biodiesel and blends, having trained eight laboratories in the country.

Another feature, studied by the INT through its Division of Energy, was the cultivation of microalgae for the production of biooils or biodiesel. With the application of a deposit of of a patent at the National Institute of Industrial Property (INPI) and with the approval of Finep, the project entitled *Microalgae for Biodiesel Production* showed promising results in countertop scale and mini tank.

### Hydrogen and Renewable Energy

In the field of energy planning, the INT conducted sectoral and regional studies on the use of alternative energy sources, carbon emissions, emissions mitigation, among others, including the development of models and scenario studies.

Studies on alternative sources included evaluations of the status of the art of technologies or scenarios and evaluations for the implementation of wind and solar energies, and biomasses.

The Network of Hydrogen Production of the Program on Science, Technology and Innovation for Hydrogen Economy (ProH<sub>2</sub>) of the MCT is led by the INT, which aimed to study different routes of hydrogen production, such as thermochemical conversion from natural gas, ethanol and other biomasses; biological production of hydrogen; water electrolysis; and generation of hydrogen from ethanol reform.

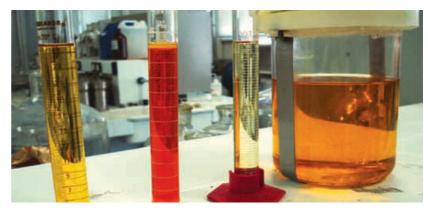


Overview of the Laboratory of Catalysis, which supports research on new routes to generate hydrogen from renewable biomasses.

This latter project aims to support the production of electricity from the polymer electrolyte membrane (PEM) fuel cell, through a system of ethanol processing. The project involves the development of catalysts for the stages of production and hydrogen purification in a laboratory scale, scale-up of catalysts, the reactor project, construction and operation of the prototype and integration with a 5 kW PEM fuel cell for power generation. The project culminated with an assembly of performance of two countertop units for producing hydrogen from ethanol and natural gas.

The gasification of biomass to produce synthetic fuels uses to advantage one of the most abundant renewable sources on Earth. The INT developed catalytic systems that can enable this process aiming to produce synthetic biofuels (similar to gasoline and diesel), using wood chips as raw material representative of the biomass. In addition to the gasification stage itself, catalysts were also developed for the conversion stages of hydrocarbons, formed in the gasifier, into syngas (reform), reaction of water displacement (shift) and Fischer-Tropsch synthesis.

The Institute also worked on the integration of the ethanol production of second generation (2G ethanol), from lignocellulosic material, via enzymatic hydrolysis. The developed projects address as much the production of 2G ethanol as the bio-hydrogen (BioH2). The ethanol production is made from cane sugar bagasse and straw via enzymatic



Tests on the Laboratory of Fuels and Lubricants.

hydrolysis and the biological production of hydrogen is made from the anaerobic digestion of organic matter.

In 2009, the INT had its Laboratory of Fuels and Biofuels accredited by the ANP, performing the 22 tests required by the legislation.

In another case, the hydrogenation of biomass in partnership with the Military Engineering Institute (IME), the INT deposited a patent for obtaining p-methane to be used as biofuel for aviation.



Biodiesel is stored in tanks, in one of the stages of the storage studies.

In the technology sector of the use of combustible gases, technologies of new equipments or dual systems were developed aiming a larger energy achievement, low emissions of pollutants and a better economy. Through the Laboratory of Combustible Gases, the INT developed tests to determine the energy efficiency and safety assessment of water heaters and gas stoves, inside the Brazilian Labeling Program. This Laboratory also operates in the sampling and characterization of combustible gases from biomass, landfills and sewage treatment plants, aiming to structure projects to generate electricity, heat, or even to mitigate emissions of greenhouse gases.

An important project at the Institute was the collection of anthropometric measures of oil and gas workers. Carried out in partnership with Petrobras, with funding from CTPetro, transferred to FINEP, the work enabled the purchase

External view of the Laboratory of Combustible Gases, addressed to the development of Natural Gas technologies.

of two tridimensional laser scanners. The equipment, the first of its kind in Latin America, provides the precise measurements of the body surface of the population employed in these units. Departing from these data, simulations of human activity are conducted in virtual scenarios, generating subsidies to map risks, optimize productivity and ensure the workers' safety.

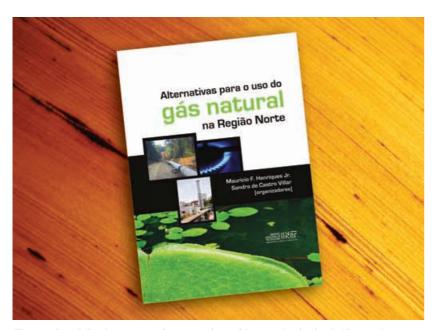
Also in the oil and gas sector, the INT has initiated, in partnership with the Federal University of Rio de Janeiro (UFRJ) and the Center for Pipeline Technology (CTDut), a study on anticorrosive coatings in different types of soil. The initiative fills a gap of trained professionals to act as cathodic protection inspectors, a kind of controlled electrochemical modification that protects the pipeline from corrosion effects when there is a failure on the coating.



Tridimensional laser scanner image captures human image for use in an ergonomics project addressed to the oil and gas industry.

In 2007, the Study entitled Agnorte - *alternatives to the use of natural gas in the Northern Region* was initiated. It was sponsored by Finep, with the participation of experts from the INT. The panorama of the Northern Region was modified in relation to the expected supply of natural gas, which will gain an impelling force with the innauguration of the complementary section of the Urucu gas pipeline, which is already in operation between the municipalities of Urucu and Coari. This addition points to a real increase in the availability of natural gas in the State of Amazonas, especially in the city of Manaus.

In accordance to this panorama, studies of the INT under the Agnorte focused on the diagnosis and analysis of the potential consumer market for natural gas in the Amazon, especially considering the city of Manaus. Besides this, the studies also considered the cities of Codajás, Anori,



The results of the Agnorte study were released in 2009 in the book Alternatives to the use of natural gas in the North.

Anamã, Caapiranga, Manacapuru and Iranduba, located along the pipeline.

The following benefits of the proposed use of natural gas in the North Region were appointed, with focus on Manaus and the surrounding regions:

- Improvement of the environment quality, with the local generation of electricity by replacing the participation of units of thermoelectric oil generation, and meeting the rising demands of an industrial activity that is quickly growing;
- The generation of new possibilities for improving the region quality of life by generating new jobs, increasing the population income levels, and new alternatives for revenue generation, and
- Implementation of an infrastructure that will ensure the sustainable expansion of the use of the LNG (liquefied natural gas) technology, which can contribute to the internalization of the development, a goal of the government and of many representations of the region, and, in the medium term, the implementation of the gas-chemical pole.

The INT had, in this period, an important participation in the Network of Excellence in Materials, Equipment and Corrosion, through the project Characterization and Evaluation of the Performance of Materials and Coatings Used in the Oil and Natural Gas Industry facing Corrosion, Mechanical Stress and Biocorrosion.

The expansion of the Institute's services to meet the oil and gas industry was also marked during this period by the project of creation of the Center for Innovation, Characterization and Evaluation of Materials for the Oil, Gas and Biofuels Industry (Numata), which is elaborating a basic project for the budge and contracting of the work in the land owned by the INT. The Center, which receives funds from Finep and Cenpes/Petrobras, through the ANP investment provision, consolidates the expansion of infrastructure of assistance to the demands of development and technology services addressed to materials and coatings used in the fields of exploration and oil platforms, on the stages of refining oil and gas, and its transportation through pipelines.

### Climate Changes

In the face of the worldwide mobilization to confront global climate changes, the INT has started an action aiming to disseminate scientific and technological knowledge and to support public policies to mitigate emissions of greenhouse gases and adaptation to climate changes.

In early 2010, the INT had approved by FINEP, a project that aims to promote training and accreditation of the INT as a Designated Operational Entity, at the Executive Board of the Mechanism of Clean Development (MCL). It is an extremely important initiative on the national scenario as it aims to provide to the domestic and to the Latin America carbon market an institution capable of meeting the demands for validation, verification and certification of CDM projects to obtain Carbon Credits, meeting the needs of companies to submit their projects in this stage of the CDM.

The project foresees the formation of a team, empowering and consolidating a base of applied knowledge, installed in the country in a public organization of a technological nature, essential when we want to have control over the activities related to validation, verification and certification of CDM projects. As a result, the expectation is to offer more competitive prices to the market within the reach of most companies that need to submit their projects, besides extending this availability to the entire Latin American market.

Another initiative related to the theme, is the Project Caipora, developed from a cooperation agreement between the INT and CBPF, which aims to develop a device that can connect to various types of sensors and therefore gather information about temperature, water acidity, carbon monoxide particles, carbon dioxide and oxygen in the air, soil data, among countless other possibilities. The results are recorded on a memory card and can be transmitted in real time. With low cost, nearly 10% of the value of the registers of limited functions available on the market, this device can be replicated and can monitor whole regions, besides performing some tasks on the opposite direction, through remote activation.

The Caipora principle is to transform the physicochemical information collected by the transducers (the technical name of the sensors which collect environmental information to the recorder) into electrical signals that are digitized, stored and transmitted. The invention uses transmission via cell phone, but it can also use the wireless network (IP Network).

Another advantage of the system, designed by the INT area of Engineering of Evaluations, is security. Data can be transmitted in an encrypted form and the memory card is not remotely accesible since it operates in its own module, with no physical connection to the electronic transmission and reception.



Above is the Caipora recorder, which stores the environment data and transmits them to a computer through telemetry.

# Science, Technology and Innovation for Social Development

### Social Development

To expand the conditions of life, of opportunities, and of the exercise of citizenship to the population. The INT performance was based on this concept of Social Development, and, attentive to sustainability, it sought technological solutions to harmonize the economic growth, justice, social welfare, environmental conservation, and the rational use of natural resources.

The organizational value of transfer of technology to society has been translated in recent years on development projects, systematization and dissemination of knowledge, technologies and methodologies in their areas of competence, focused on the training of human resources and on the promotion of citizenship, in line with the eight Millennium Goals, set by the Uited Nations (UN).

Over the past four years, aligned with the program of Science, Technology and Innovation for Social Inclusion and Social Development of the Ministry of Science and Technology (MCT), the INT afforded prior attention to projects that aimed to reduce social exclusion, create jobs and income, and provide a better quality of life to disadvantaged populations.

The convergence of these actions, values and principles resulted in the creation of the Center for Social Development, in its formal structure at the Institute in 2009, a pioneer and still unique attitude among the research units of the MCT. The Center's role is to coordinate, implement, monitor and evaluate technological projects with social bias, working in partnership with other areas of the Institute competence.

The INT's commitment to social development was evident in the implementation of projects aiming to improve the life of society, which include:

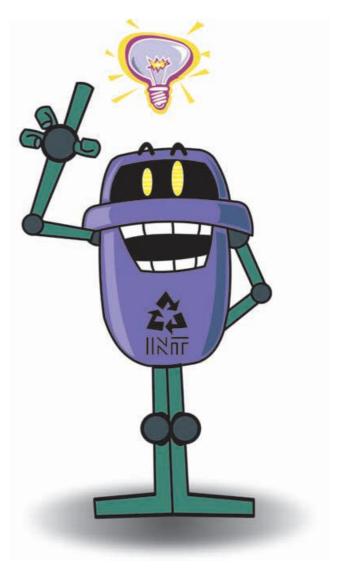
JuraPET - training for residents of the Morro do Juramento in the Northern
Zone of Rio de Janeiro, for the production of parts produced from PET
bottles;



Residents of the Morro do Juramento learning technique aimed to income generation.

- Design of a kit for mercury detection monitoring of the health risks of populations exposed to mercury contamination, especially in the Amazon Basin;
- Project Integrate development of a Management Model of the Political-Pedagogical Project on Pre-School Education of the Municipality Network of São João de Meriti/RJ;
- Implementation of Management Technology for Education Institution (Sigesc Web);
- Waste use of the processing of ornamental rocks;
- Flywheel libraries design of mobile units to carry books for a project in partnership with the Citizenship Action;
- Virtual Environment of Cooperative Learning (Sigesc AVA);

- Sunflower and castor bean biodiesel in a project to encourage family farming;
- Waste Recycling Partnership: joint implementation of selective collection at the INT;
- Packing for Minimally Processed Organic Hearts of Palm;
- Research and Development of Information Display in Braille partnership with Clara Idéia Design;
- Development of equipment for mass Rugby from the inclusion of the sport in the Public Education Network - aims to technological innovation for mass sport from methods, equipment and training of trainers (Funding: Faperj - Partnership: Municipal Education Foundation of Niterói / Brazilian Association of Wheelchair Rugby);
- Accessibility to the Contents, Services and Information of the Collections
  of Physical and Digital Research Units of the MCT Installation of a
  center that is a model of care for people with disabilities by providing
  access to contents, services and information of the physical and
  digital collections of the INT. Partnership: Secretariat of Science and
  Technology for Social Inclusion/MCT and Brazil Accessibility);
- Sharing Skills Program created in 1999 with the aim of facilitating
  the sharing of knowledge and skills, contributing to the development
  of the intellectual, emotional and innovative capacities, and actions
  focusing on the welfare of the INT workforce, and
- Design of a special wheelchair for a discus throw paraolympic athlete.



"Zecológico" the mascot of the INT Waste Recycling Partnership.



The Braille display presents the text of the calls in the language for the visually impaired, with the detailed sound information, and interpretation in pounds for the deaf and dumb.



The INT Library was equipped with devices that support the acess of the special public.



ClassTraining of the Project Development of equipment for mass Rugby from the inclusion of sport in the Public Education Network. INT/FAPERJ Partnership.



Activity of the Sharing Skills Program.

### Popularization of Science, Technology and Innovation

The INT area of Communication performed many activities aiming to popularize C,T&I. Shares of Media Relations made possible the inclusion of 1196 news on the media in the period between 2007 and 2010. The disclosure of the activities conducted at the INT also had the support of a 12-minute corporate video and was carried out through 40 issues of the electronic Newsletter On Line INTegration (INTegração On Line).

In the area of external events, the INT maintained its participation in major integrated actions of popularization, led by the Secretariat of Science and Technology for Social Inclusion (Secis) of the MCT, as ExpoT&C (held during the Annual Meeting of the SBPC) and the National Week of Science and Technology. Internally, it conducted events such as the Technological Tuesdays (Terças Tecnológicas), aimed to disseminate the Institute's areas among the university population.

Through the project Creation of Educational Kits for the Popularization of Science Teaching, led by the INT, in partnership with UERJ and the Colégio Estadual Visconde de Itaboraí, contemplated by the Ordinance Dissemination and Popularization of Science and Technology in the State of Rio de Janeiro - 2009, issued by Faperj, monthly lectures were monthly held, in addition to visits to the Institute's laboratories. The event reconciled biology and chemistry knowledge used at the INT with the curriculum used in High School.

In the period, the Institute has also launched the second volume of the collection Notebooks of Technology (Cadernos de Tecnologia) with the theme Climate Changes and Technology, aiming to disseminate to the population technological knowledge related to global warming.

With the theme Technological Innovation, in turn, the INT has led to the general public, to other research units and the business community, through lectures on



The INT booth in the MCT Hall, at the 15th edition of the Exhibition of Technology, Science and Innovation (ExpoT&C).

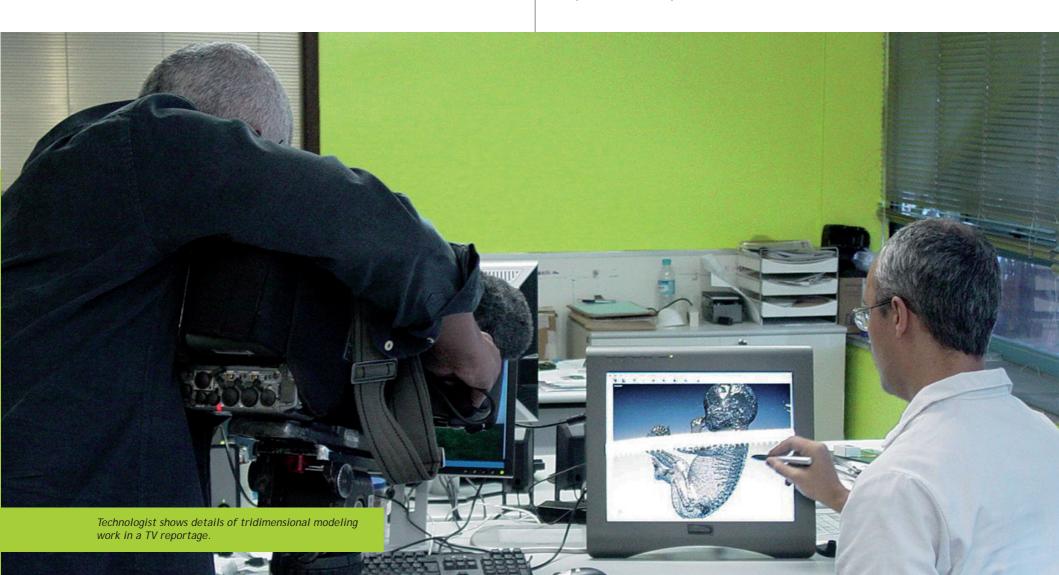


Recording of institutional Video of Sibratec Network for Health Products.

each of those forums, the knowledge of its experience with the legal frameworks of the Law of Innovation (Lei da Inovação) and the Law of Good (Lei do Bem).

The Coordination of Linkage and Institutional Representation worked on projects like the Porto Maravilha, which started a large revitalization of the urban, social

and cultural infrastructure of the area of the port of Rio de Janeiro and its surroundings. It also promoted internally, with the support from the Center for Social Development, various initiatives to disseminate information of social nature, such as traffic safety, prevention of AIDS and STD, International Women's Day, International Day for the Environment and others.





# **INT** numbers

## **Human Resources**

Table - Composition of the INT workforce

JOB POSITION		PhD		MASTER		SPECIALIZATION		HIGHER EDUCATION		HIGH SCHOOL AND ELEMENTARY SCHOOL			TOTAL											
	2007	2008	2009	2010	2007	2008	5000	2010	2007	2008	5002	2010	2007	2008	5000	2010	2007	2008	5002	2010	2007	2008	2009	2010
Server with higher education Level	48	47	46	52	39	36	40	44	70	63	52	48	4	3	3	3	0	0	0	Ö				
Server with high school level	0	0	0	0	1	2	3	3	87	81	82	79	0	0	0	0	17	10	11	18				
DAS required	1	1	1	1	0	0	0	0	1	0	0		0	0	0	0	0	0	0	0	275	249	248	25
DAS without bond	2	1	1	1	1	1	1	1	2	1	- 1		2	3	3	0	0	0	0	0				
Transferred servers	o	0	2	2	0	0	0	0	0	0	2	2	0	0	0	0	0	0	Ó	0				
Service providers - higher education level	>=	5	4	7	-	0	0	4	-	7	6		29	13	13	34	0	0	0	0				
Service providers - high school level	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	21	18	20	20	51	44	44	67
Service providers - elementary school	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	1	1	1	1				
Fellows and interns	15	10	11	20	13	17	16	32	10	9	3	18	49	57	56	57	34	36	68	94	121	129	154	22
Total NIT workforce	66	64	65	83	54	56	60	84	170	161	146	149	84	76	75	94	73	65	100	133	447	422	446	54

Note: Data of Servers from 2009 to 2010. Information of the INT/General Regional Coordination in Rio de Janeiro and Cetene.

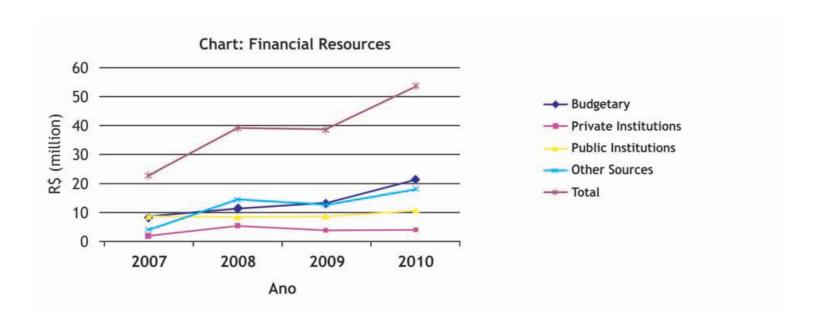
Source: Human Resources Division (HRD)

## **Patent**

		BRAZIL		ABROAD					
YEAR	PI/MU Deposited Patents	Software registration	Other applications for protection	Patents PI/MU	Registration software	Further requests for protection			
2007	7	0	1	1	0	0			
2008	5	1	4	1	0	0			
2009	7	0	2	5	0	0			
2010	9	0	3	1	0	1			

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# Financial development



# **Projects**

NUMBER OF PROJECTS, PROGRAMS AND ACTIONS WITH NATIONAL AND INTERNATIONAL INSTITUTIONS						
YEAR	BRAZIL	ABROAD				
2007	142	09				
2008	167	13				
2009	154	15				
2010	139 *	14				

<sup>\*</sup> Number related to the first semester of 2010.

### Internal events

YEAR	No. of events			
2007	12			
2008	12			
2009	23			
2010	16			
Total 2007-2010	63			

## **Publications**

YEAR	No. of publications in scientific journals			
2007	148			
2008	160			
2009	120			
2010	44 (until September)			

## Inserts on the media

YEAR	No. of insertions			
2007	207			
2008	220			
2009	333			
2010	336			
Total 2007-2010	1.096			

#### **Awards**

#### 2007

- The INT technologist, Fabio Bellot, receives the Inventor 2007 Prize, sponsored by Petrobras;
- The National Program for Energy Conservation (Conpet) Prize within the Program of Labeling of Efficient Appliances and Equipment - 2007 and
- The work of the INT technologist, Jorge Lopes, is a finalist in the Electrolux Design Lab World Competition in 2007.

#### 2008

- Award of the National Program for Energy Conservation (Conpet) within the Program of Labeling of Efficient Appliances and Equipment - 2008;
- First place in the *Valpak Design Award*, Valpak, UK, with the project presented by the technologist Jorge Lopes, and
- Effective Partnership Award in 2008, of the Municipal Secretariat of Persons with Disabilities (SMPD) of Rio de Janeiro, Public Institution category, for the work led by technologists Saul Eliahú Mizrahi, Jane Rocha Cíucero, Gil Brito, Luiz Carlos Motta and Andréa Lessa.

#### 2009

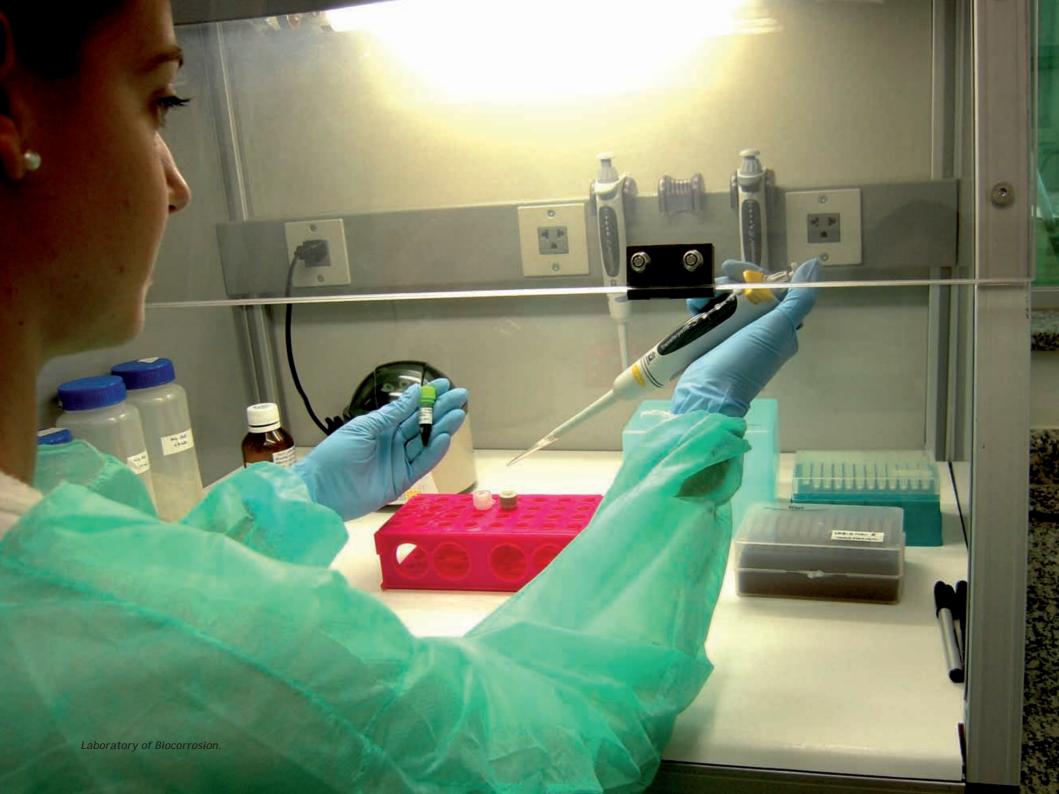
- The INT receives the 1st place in the Public Institution category, with the best practice in transfer and technology partnership. Prize awarded by the National Autonomous University of Mexico (Flacso), the University of Concepción, Chile, and PUC-RS;
- The INT director, Domingos Manfredi Naveiro, receives the Friend of the Navy Medal, in recognition of services rendered by the INT in meeting the ideals and goals of the Navy of Brazil;
- Honorable Mention in the Rio Pipeline Conference 2009 for the best work in the area of Reliability and Risk Assessment, Article "High Risk Process Control System Assessment Methodology", presented by the INT Technologist, Maria Cristina Zamberlan;

- Award of the National Program for Energy Conservation (Conpet) within the Program of Labeling of Efficient Appliances and Equipment - 2009 and
- The INT technologist, Jorge Lopes, is awarded the Helen Hamlyn Design Award, Royal College of Art/Helen Hamlyn Centre 2009.

#### 2010

- The work of the INT technologist, Mauricio Francisco Henriques Júnior, is awarded at the meeting in Public Policies on Energy I, VII Brazilian Congress of Energy Planning, held in September 2010 in São Paulo. Title: "Alternatives to the Use of Natural Gas in the North Region";
- The technologist Marcelo Schwob is selected among the ten best works in the XIII Brazilian Congress of Energy (CBE) in novembro/2010, Rio de Janeiro, with the article "Advantages of electric propulsion applied to urban road transportation in express lines";
- The INT receives an award from the National Program for Energy Conservation (Conpet) within the Program of Labeling of Efficient Appliances and Equipment - 2010;
- Honorable mention, best short paper in computing, at the IX Brazilian Symposium on Games and Digital Entertainment SBGames, with the work "A real-time simulator for ergonomics and displacement evaluations", presented by the personnel of the INT Laboratory of Ergonomics;
- The INT is awarded the 3rd place in the Southeast stage of the Finep Technological Innovation Award in the category of Science and Technology Institution, and
- The article "Tridimensional models of fetuses produced in rapid prototyping equipment from magnetic resonance and ultrasound" presented by the technologist Jorge Lopes, is considered the best work in Latin America, at the RSNA event, sponsored by the Radiological Society of the USA.





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# Impact on results The views of customers and partners

Next, we present the following testimonials from customers and partners about the relationship maintained with the INT in meeting their demands, thus highlighting the impact of the achievements of the work developed at the Institute:

#### AGROSUISSE CONSULTORIA (Consulting)

"All actions generated by the INT brought direct benefits to our customers and to our company. The company operates in the segment of agricultural, agribusiness and rural development consulting. The sector is undergoing profound changes that require an increasingly technical knowledge in several areas. The partnership of the INT/Progex results in strengthening the strategies of customers. With the partnership, it is possible to conduct projects based on technology, reducing risks. Moreover, we had the opportunity to add value to products and services developed by the INT. The projects represent a good incentive to the customer to achieve his technical, business and commercial goals."

(Fabio Ramos - Director of Consulting Agrosuisse)

#### AGTAL - A. GUEDES TORREFAÇÃO DE AMENDOIM LTDA (Foods)

"The INT contributed significantly to develop a communication tool for prospects abroad (through the bilingual website), and on developing an innovative product to be launched in the 1st semester of 2011 with great expectations of our commercial area, both for the internal market, as for the export market." (André Guedes - Director of AGTAL - A. Guedes Torrefação de Amendoim Ltd.)

#### **ARGAMIL (Cement)**

"The INT was very important in the construction of the factory of Santo Antônio de Pádua when it enabled the separation of fine waste in sawmills. In recent surveys contracted by FIA (USP), Argamil consolidated its position as the second brand of the state of Rio de Janeiro, only behind the nationally and globally leading brand. "

(Djalma Brandão - Argamil General Manager)

# ASSOCIAÇÃO BRASILEIRA DE RÚGBI EM CADEIRA DE RODAS - ABRC (Brazilian Association of Wheelchair Rugby )

"We hope this project will materialize and that the chairs will approach the level of imported chairs, which cost on average \$ 3,000. I would like to see the application of this technology and see the athletes using the chairs which will help to train good athletes. The financial part is lacking to develop the equipment that is already scrapped. For the future, the massification of sports is the most important. We know how this sport can help the disabled, giving them a better quality of life, since he is included, shows the overruns, gives more autonomy, among other achievements."

(Eduardo Mayr - President of ABRC)

#### **BLESS YOU (Clothes and accessories)**

"From the beginning, the attention given to us was amazing, we thought that only large companies could be met by the INT, or that the treatment would be different. However, at all times, we were served promptly, all doubts have always been solved very quickly. Thus, we feel free to make any appointment, since we know that the service will be fast and efficient."

(Rosangela Mathias - Director of Bless You Trade of clothes and accessories)

#### CACHACA MENINA DO RIO (Cachaca)

"There are about 600 producers of rum in RJ. There are 60 companies registered at the Ministry of Agriculture, and only our cachaça Menina do Rio has certification and postage from Inmetro and INT, which confers the control of product quality."

(Sergio Lund - Manager - Cachaça Menina do Rio)

#### CAPTA TECNOLOGIA EM SISTEMAS (Technology on systems)

"I think it is a very important partnership because it enables the performance of projects for enterprises that can not afford to do them."

(Hilton Yama - Director of Capta Tecnologia em Sistemas)

#### CENTRO BRASILEIRO DE PESQUISAS FÍSICAS

#### (Brazilian Center for Physics Research)

"CBPF and INT in partnership conducted the project Caipora that allows applications in environmental monitoring or measurement of physicochemical impulses in industrial applications, and development of biomaterials in the nanotechnology area. In the area of innovation, CBPF and INT have had a prominent role in structuring the Arrangement of the Technological Innovation Centers of Research Units (UPS) of MCT in the State of Rio de Janeiro and the creation of an Innovation Management System for the UPs of MCT."

(Marcelo Albuquerque - CBPF)

#### **EDUCAÇÃO ESPECIAL (Education)**

"As a result of the partnership between the INT and the Coordination Bureau of Special Education and the Municipal Education Foundation of Niterói, stand out: the making of a postural armor for a student with quadriplegia from the municipal Education network, presented at the International Congress on Social Inclusion in San Jose, Costa Rica; the expansion project of rugby in schools in the city of Niterói (under implementation), and the making of the Inclusive mural to be made available in schools and public spaces."

(Teacher Nelma Alves Marques Pintor - Coordinator of Special Education of Niterói)"

# EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA - EMBRAPA (Brazilian Enterprise for Agricultural Research)

"We started a work, via Progex/RJ, for completion of a service at the Portobello Hotel Resort on minimal processing of pupunha palm. A feasible packing for the product was created by the INT Division of Industrial Design.

The work resulted in the development of two patents. It was the first time that the BNDES approved a research project. The packaging industry needs new products and horti-fruit products have high levels of post-harvest losses. This project is of high importance to the agribusiness sector."

(Antonio Gomes Soares - Embrapa)

#### FAPECA LINGERIE (Lingerie)

"Our relationship with the INT was always very professional and it helped us to reorganize the factory, and our production shifted from 20 thousand to 50 thousand pieces per month, and the number of employees rose from 25 to 45."

(Pedro Felix - Director of Fapeca Lingerie)

#### FINANCIADORA DE ESTUDOS E PROJETOS - Finep

#### (Financial and management projects)

"The relationship of Finep with the INT has been to meet the demands of finance, management of research projects and measurement of the achievement of agreed targets and the financial execution of projects. The INT helped Finep to fulfilling its Mission of a public agency of development promotion that aims to 'transform Brazil through Innovation' by developing products/processes, to lead innovation to Enterprises, and to assist them in the elaboration of programs to support Innovation;

We can emphasize that the participation of the INT has helped the Enterprise and especially the Area of the Institutes of Technology and Research - AITP in fulfilling its mission. "

(Avílio Franco - Superintendent of The Institutes of Technology and Research of Finep)

#### FORTEC (Management and technology) and PUC-RS (Education)

"I answer the question as Former President of Fortec and as Coordinator of the ETT, PUC-RS. I believe that the organization of innovation at the INT and the fluid joint between the Direction and the government agencies responsible for the management of intellectual property and technology transfer are important aspects to be highlighted as strengths. With regard to participation in the research project, the INT was among the three Brazilian institutions that presented the best performance in terms of management practices in accordance with the methodology proposed for Knowledge Management, including: Knowledge Management, Identification of Intellectual Assets, Project Management for Value Generation, Mapping of Knowledge and Competitive Intelligence, Service Portfolio, IP Management, Transfer of Results, Evaluation and Motivation of Personnel and Development of Business and Customer Capital."

(Maria Elizabeth Ritter dos Santos - Coordinator of the Office of Technology Transfer at PUC-RS)

#### FUNDAÇÃO MUNICIPAL DE EDUCAÇÃO DE NITERÓI - FME (Education)

"The partnership with INT is crucial. The school system of Niterói receives a large number of children with disabilities. Even with a large team and the competence of the professionals involved, we could not keep up with demand, as we became reference. Thus, the partnership with INT supports us in this walk. These actions allow us to offer more opportunities to this public."

(Luiz Felipe Martins Valadão - Coordinator of Physical Education of FME)

#### **IDEAL BEQUEM (Furnitures)**

"We developed some products in this partnership in order to achieve differentiation in the national market of hospital furniture. In our strategy, the INT was important in the search for standardization in the production process, which allowed a better manufacturing organization, establishing a modern aesthetic standard. Combined with other factors, this led the company to a highlighted position in the events in the area, resulting in increased sales of the products developed in this partnership and a major impact on events where the company exhibits its production."

(Marcio Racca - Industrial Designer of Ideal Becher Móveis Hospitalares)

# ISABELE DELGADO ARTIGOS DO VESTUÁRIO - CICLO AMBIENTAL - MODA EM FIBRA PET (Clothing articles - Environmental cycle)

"I consider our company's relationship with INT efficient and productive, contributing to our strategy in the organization of the processes and procedures of the company in various aspects, such as in the professional training for export through courses offered by the Banco do Brasil, the the company's Certification by Ecocert, the table of pricing and cost organization and the creation of a mini collection, through the Progex project."

(Isabele Delgado - Director of Ciclo Ambiental Moda em fibra PET)

#### KSL FITNESS (Fitness)

"From the knowledge gained by consultants financed by the INT, a significant growth of the brand was feasible in 2010. It was possible to know that the product, in addition to the quality of development and form, was within the

conditions of competition to ensure the mark safety to reach new horizons. And new sales channels were opened. Creativity was encouraged and expanded during this relationship because the higher control of purchasing, production and sales has enabled this organization to focus on strategies related to the product. As a result, sales increased."

(Livia Richa - Director of KSL Fitness)

#### MAGDA CRISTINA CONFECÇÃO E ACESSÓRIOS LTDA

#### (Clothing and accessories)

"INT was a partner of great importance for business development. I requested technological care via Progex, aiming adequacy of packaging, and I received not only care, but also support for new projects. Then I can continue the development of the company through the First Export Project, thus yielding new partners and strengthening the company. I thank the entire INT team for all the effort to leverage the business community."

(Magda Cristina - Director of Magda Cristina Confecção e Acessórios)

#### MALWEE MALHAS LTDA (Knitwear)

"The relationship with INT was quite productive, with professionals of high quality both technically, and personally. With the accelerated depreciation by the INT, we maintained our business competitiveness and we could make the replacement of our property more often and we installed newer machinery and equipment. We gained in productivity and technology and had a significant increase in sales and we hired new employees."

(Venturi - Accounting Manager of Malwee Malhas Ltda)

#### MARISOL (Children's clothing manufacturing)

"As a result, we can point out the raise in the Company's sales, exceeding by over 300% in recent years, after the work conducted by the INT, and we are now a competitive organization in quality and production as well as in the assistance we give to our customers."

(João José Bizatto - Marisol Manager)

#### MONTHAL LINGERIE NOITE (Lingerie)

"The Monthal relationship with the INT is based on partnership and trust. The Institute contribution was of great importance, especially for the production, an area which we could organize and optimize aiming to increase it and to gain market share both domestically and internationally. With this partnership, we could better measure our production. We realized the real situation of our cost of parts, which was an excellent indicator to gain market competitiveness. "

(Priscila Dias Nogueira - Manager of Marketing and Sales of Monthal Lingerie Noite)

#### **MÓVEIS CALENZANI (Furniture)**

"Our relationship with INT was excellent, and as a result it gave us the first fruit: the award at Prime. Besides, the knowledge achieved through research and the work that has been done showed that we had to improve the quality of our products and our organization before exporting. And, with a joint effort, when the company begins to adjust to this, it makes all the difference in the domestic market. Hence, growth in this period was paramount."

(Josivan Caetano - Director of Móveis Calenzani)

#### NOKIA (Mobile telephones)

"We had much difficulty discarding unwanted material without paying taxes because we did not have a technical opinion that they were obsolete. All these liabilities (25 containers) generated a huge problem since we had to pay rent for these containers."

Through the INT reports we were able to prove that this material was indeed obsolete and we have been selling it to a trading company since then. Today we only have eight containers. "

(Ana Ozório - Nokia Manager/Manaus)

#### PINHEIRO NETO ADVOGADOS (Lawyers)

"Besides valuing depth in research and reliable answers, the INT major difference is to present very well grounded reports (without losing objectivity) in a language much appropriate for specialists and laymen. This, I believe, is also one of the reasons why the Institute's work is so well recognized."

(Luiz Roberto Peroba - Partner of Pinheiro Neto Advogados / SP)

#### **PUMAR E CIA (Umbrella)**

"The INT intervention contributed 100% to Pumar reengineering, be it from the theoretical point of view-implementing advanced production techniques, training the personnel of the factory floor - or in the development of new technologies in the production line. A true revolution."

(Lucia Pumar - Director of Pumar and Cia.)

#### SESI-SENAI (Professional education, Industrial development)

"Our relationship with the INT was positive, considering that we were to facilitate two assistances in the Municipality of São Gonçalo. The companies served by PROGEX were San Marco and Bless You, and they were very happy with the exports outcomes."

(Inês Taissun- Manager of the Operating Unit São Gonçalo - Sesi/Senai)

#### TECHNER (Locks)

"Through the competent team of the INT Industrial Design, we managed to create innovative products (design) which were very well accepted by the market. Moreover, this partnership enables us to reduce some risks in developing new products, since the ergonomic studies and the market research define the style and preference of the consumer market, resulting in a 20% increase in the redesigned products sales."

(Fernandes Azeredo Jr. - Executive Director of Techner)

#### TIFERET INDÚSTRIA E COMÉRCIO LTDA (Industry and trade)

"The relationship has helped to facilitate some stages of our enterprise innovative projects, helping us to have a differentiated line with the possibility of insertion in the international market. As results, we achieved the organic certification and the final product preparation for export and some major retailers."

(George Braile - Director of Tiferet Indústria e Comércio Ltda.)

#### UTILINOX (Manufacturing of steel fasteners, bands, clamps and supports)

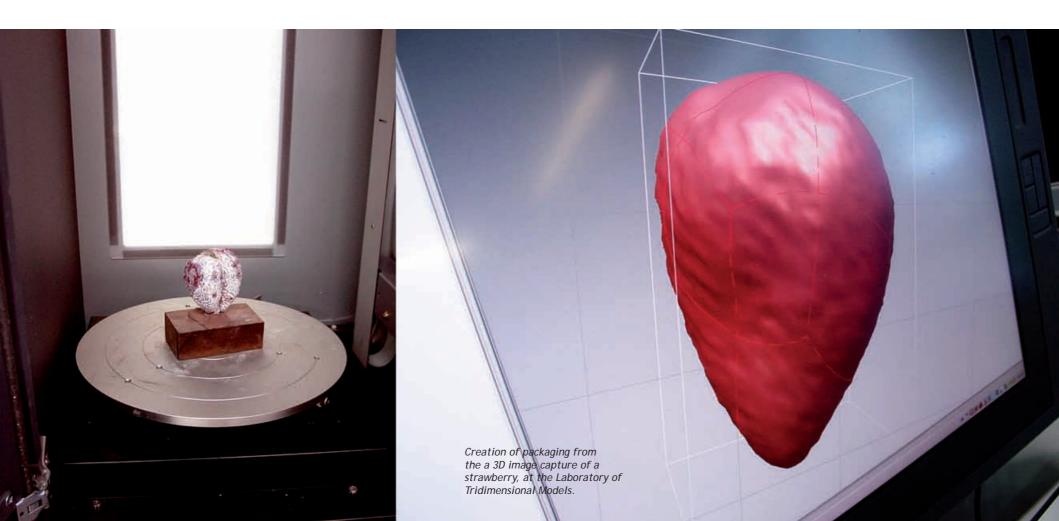
"Our relationship with the INT was of great significance to the company's organization, structuring, and growth, because the certification was paramount for us to reach new business abroad. We added quality, safety and respect to our brand." (José Amorim - Commercial Director of Utilinox Com. e Ind. Ltda)

#### VANDERSON SILVA (Wheelchair)

"INT revolutionized the adapted sports, especially discus throw and shot put. It considerably facilitated the transportation of the material and of the wheelchair itself, which is easy to assemble at the training and competition locales, and has a totally differentiated design.

The INT was crucial to the wheelchair's construction because it believed in the dream of athletes with physical disabilities, which proved to be a feasible idea. A success, thanks to the designers of the Division of Industrial Design."

(Vanderson Silva - Brazilian athlete with physical disabilities - Pan-American record in discus throw)





# Vision of the future

To confront the challenges of Science, Technology and Innovation in Brazil, the National Institute of Technology (INT) has strengthened its polytechnic characteristic to meet the current demands of society, especially in Oil and Gas, Petrochemical, Renewable Energy, Health, Social Technologies and Defense, with the support of its renowned expertise.

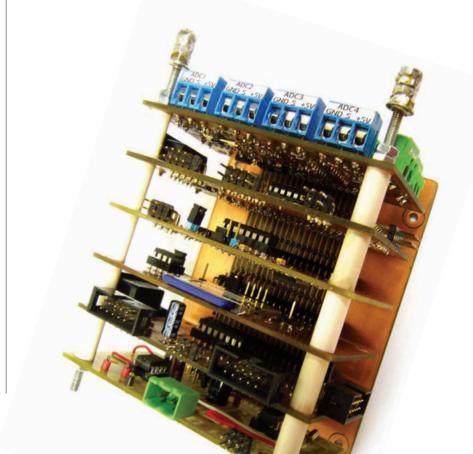
These actions are aligned with strategic plans and programs of the Federal Government. Therefore, they primarily address the MCT Action Plan 2011-2015. We have to emphasize that, in addition to this, the INT technological production is still associated with and will contribute to the new goals of other federal governamental agencies, such as programs in Energy of the Ministry of Mines and Energy; the More Health, of the Ministry of Health; and the Productive Development Policy, of the Ministry of Development, Industry and Foreign Trade. There is here a clear linkage between the focus of activities aiming the best use of national resources and guidance to the efficiency and competitiveness of the Brazilian economy.

Making use of its personnel expertise and through prospecting technology, the INT becomes fit for expanding its work with the government and especially with the MCT, contributing, in addition to performing, to the formulation of C&T Policies and Programs.

Innovation shares addressed to the productive sector are expanded by means of its own expansion in the national territory and insertion of new customers. To reach the market, through the knowledge and technology generated, partnerships are formed with various actors in society, government agencies, standards bodies, individuals, industrial and services enterprises, research institutes and universities. The Institute expands this strong interaction with the productive sector through the transfer of technology, aiming the

strengthening of the strategic role of innovation in enterprises and public organizations. An important road has been the increasing participation in cooperative networks which run in accordance with Sibratec, encouraging the complementarity of expertises.

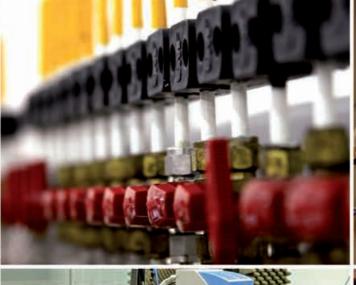
The recent investment in laboratory infrastructure provides the INT the technical foundation to face new technological demands. This growth of structures, and consequently of the activities, leads to the need for physical expansion, and to the search for new spaces in order to meet the demands of partners and society in general.



About to turn 90 years on December 28th, 2011, the INT stands firm in the trajectory of its institutional mission, as defined in the Strategic Map of the Institute, promoting innovation, valuing sustainable development, and aiming to achieve the institutional vision of "being recognized as a national reference by 2021 in research and technological development for innovation."



































## **Conduction:**

**Communication Division** 

## Photography:

Justo D'Ávila Taís Salazar Paulo Rodrigues INT Collection

## **Collaboration:**

Division of Technology Strategies (Divisão de Estratégias Tecnológicas)



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