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CONCENTRATION AND DYNAMISM

Focus on international markets as a central feature of corporate strategy

In order to be successful, applied research needs to be flexible in its responses to rapidly changing market conditions. This has been the guiding principle of the Seibersdorf Research Centre in its industry-oriented research activities throughout 1993. The pooling of resources and the expansion of capacities enabled the Research Centre to fulfil its tasks and achieve a satisfactory operating result.

To secure the conditions necessary for long-term future success, measures were taken to modernize the scientific and technological infrastructure of the Research Centre. The construction of the new radio-pharmaceutical laboratory, the establishment of a competence centre for the micro-characterization of materials, and the opening of a modern sterilization facility testify to a consistently future-oriented corporate strategy. The national and international competitiveness of the Centre has been further enhanced in this manner.

The international orientation of the Seibersdorf Centre has been laid down in its medium-term corporate strategy. Last year, important steps were taken to promote the integration of the Austrian Research Centre into the European research framework.

At the national level, efforts were made to achieve better coordination of non-university research activities in Austria. Fortunately, this did not involve the establishment of new and costly organizational structures. Cooperating in a joint working group with the two other major research institutions in Austria - the Arsenal Federal Research and Testing Centre and Joanneum Research - the Seibersdorf Centre is able to offer a comprehensive range of services to industrial clients in Austria and abroad.

Univ.-Prof. Dr. Peter Koss
Managing Director Science-Technology

Dr. Winfried Schenk
Managing Director Business-Marketing
CHALLENGE AND OPPORTUNITY

On the threshold of a united Europe - Seibersdorf proves to be competitive in many areas

More than ever before, research and technological development are among the most important factors of competition. Serious deficiencies have been found to exist in the countries of the European Union. Even today, its member countries invest less in the development of new technologies and have fewer qualified engineers and scientists than the United States and Japan. Hence, the new White Book of the European Union places a special emphasis on international cooperation.

Austria has used the opportunity to participate in the fourth framework programme of the European Union. The operational divisions of the Seibersdorf Research Centre are continuously expanding their international relations, particularly through participation in cooperative European research projects.

Since 1992, a total of 29 projects have been approved within the framework of EU, COST and EUREKA projects. A large number of other projects have been made possible thanks to financial aid provided by the Federal Ministry of Science and Research. Currently, 28 such projects are in preparation. Moreover, bilateral cooperation with European research institutes has been intensified.

To maintain the competitiveness of the Austrian economy, strategic alliances with companies and scientific institutions are being promoted at the national level.

Cooperation with the universities has also been intensified. It is becoming increasingly apparent that the know-how and the experience of Seibersdorf staff researchers is in high demand at the universities, where 23 scientists from the Research Centre currently hold teaching positions at various levels of the academic hierarchy. Through their teaching activities and their supervision of doctoral students, they bridge the gap between basic and applied research.
RESEARCH FOR THE ECONOMY AND THE ENVIRONMENT

Our success is based on a flexible and market-oriented organizational structure.

The new organizational structure, introduced a few years ago, combined with a rolling planning strategy, enables our operational divisions to adjust to the requirements of the market in the best possible manner. Having adopted the profit-centre approach, the individual operational divisions are largely autonomous in scientific issues and within the framework of their budgetary resources.

As a result of this application-oriented corporate strategy, another important focus has developed side by side with our international approach. For all divisions, environmental engineering and environmental planning as well as the development and improvement of methods for the protection of ecological systems have become important fields of research.

A company's volume of contract research is an important measure of its market-orientation and the quality of its expertise. The Research Centre has a most satisfactory record in this respect: in the year under review, the Centre’s R&D revenues increased by another 3.7%, thus bringing its self-financing ratio up to 58% of operating costs. Hence, Seibersdorf ranks among the very best of all comparable research institutions in the world.
"Strategic alliances with industry"

In the face of world-wide competition, the economic performance of an integrated Europe will be largely dependent on research and technology development. From the Austrian point of view, access to the European Union research projects is a major challenge. With industry striving to offer an ever wider range of new products, the Seibersdorf Research Centre must be in a position to offer innovative solutions to meet the specific requirements of the R&D market. In the field of instrumentation and information technology, our development potential has proved to be of special interest for the public sector, especially in the environmental field.

Against this background, numerous projects were launched last year. We developed equipment to measure gas emissions from landfill sites, we began to set up a country-wide network of ozone measuring stations in Austria, we delivered a high-precision unit to monitor the quality of drinking water supplied to Vienna, and we designed equipment to determine the quantitative dissemination of pollutants in cooperation with the European Research Centre in Ispra, Italy.

To meet the requirements of European legislation, the electrical and electronic industries will have to prove that the electro-magnetic radiation emitted by their products does not constitute a health hazard. Therefore, we have taken all the necessary measures to ensure that the required tests can be performed at Seibersdorf according to the relevant standards, so that Austrian companies can export their products to the countries of the European Union without any problems.

New opportunities to enter into "strategic alliances" with the industry also arise in the railway and PTT sectors. Modern management instruments, such as risk analysis or preventive maintenance, are of crucial importance for service companies of that size. As a highly competent partner, the Seibersdorf Research Centre offers its support in the implementation of strategically important measures.
LARGE-SCALE EXPERIMENT IN THE SKY ABOVE EUROPE

The European Union intends to simulate an environmental accident - using a sampling device made in Seibersdorf

Depending on weather conditions, an accident occurring in an industrial plant or a power station anywhere in Europe and involving the release of large volumes of pollutants can affect the whole continent.

In the event of such accidents, computer models are to be used to forecast the time of arrival and the concentration of pollutants to be expected, so that precautions can be taken in time. To test the accuracy of these models, the European Joint Research Centre in Ispra intends to simulate an industrial accident. For the purposes of this experiment, a special perfluoro-hydrocarbon - a so-called tracer substance - will be released and its propagation traced. By means of gas chromatography, the substance can be detected even in concentrations as low as 10-15 percent by volume. The method presents no hazard to human health or the environment.

Austria will also participate in this large-scale experiment (ETEX) to be performed in the course of 1994. A sampling device for the collection of air samples at 200 sites throughout Europe has been designed by the Seibersdorf Research Centre. The volume of pollutants thus collected provides valuable information on their dissemination. The programming of the microprocessor-controlled unit must be highly flexible, given the fact that the beginning of the experiment will be determined at very short notice.

As a preliminary project, the ambient concentration of the tracer substances in Austria was determined. Accurate information on these values is essential to determine the volume of the tracer substance to be released in the experiment. The studies will be carried out in cooperation with the Austrian Centre for Meteorology and Geodynamics.
DATA NETWORKS SPANNING THE WORLD

Multi-media technology opens up a new era of electronic communication - a challenge for Seibersdorf

Computer networks are used for the exchange of information in Europe and throughout the world. Before long, video, voice and music will also be transmitted via the global network. "Multi-media" is the slogan which marks the beginning of a new era in information technology.

Managers will talk to their business partners abroad in video conferences. Architects will do their designs on the computer screen and transmit them to their clients via networks. "Distributed multi-media libraries" or "electronic newspapers" are other examples from this wide field of application.

These developments bring new challenges not only for computer scientists, but also for the networks provided by postal administrations. Huge volumes of data have to be processed and transmitted. The information underlying a one-second video transmission comprises a few hundred pages of code.

Fast retrieval of information in rapidly growing computer networks and the intensive use of hyper-links (logical connections between arbitrary pieces of information) are other major challenges. The latter leads from conventional sequential documents to "hyper-documents": gigantic webs of hyper-linked documents which allow users to walk freely through according to their needs and interests.

Within the framework of research projects undertaken with Digital Equipment Corporation, Seibersdorf researchers analyzed the requirements to be met by software tools (author systems) for the generation of dynamic and distributed documents and developed pilot implementations. The objective of the study was to represent the complicated relationship between document components and user interactions in a simple manner.

As a result of this project, a team of experts from Seibersdorf was invited to participate in the work of international standardization bodies (ISO/IEC JTC29/WG29 MHEG) and in OMHEGA, an ESPRIT III project.
PRECISION BY AUTOMATION

For the first time, computer control permits fully automatic trimming of industrial thermometers.

Platinum resistance thermometers are widely used in industry and technology because of their favourable properties as temperature sensors.

For one particular type of these temperature sensors, platinum wires are wound around a glass core, the wire length being trimmed in accordance with the desired electric resistance. Together with Juchheim Company, one of the largest manufacturers of temperature sensors in Europe, the Research Centre has designed a micro-robotic device which is controlled by a PC and adjusts the wires to the exact length in a fully automated procedure.

The temperature sensors arrive at the manufacturing line with pre-wound bifilar platinum wires. An operator places the sensors on transport frames. At the measuring and trimming station, the sensor is automatically picked up by its terminal wires by means of measuring pliers. The platinum wires - thinner than a human hair - are also clamped automatically by means of twisting pliers and stretched to a predefined tensile stress. Depending on the measured resistance value, the glass core is turned by the measuring pliers and a section of bifilar resistance wire is unwound and twisted. This procedure is repeated until the desired resistance is reached within pre-set tolerances.

Use of this automatic device helps to streamline the manufacturing process and eliminates the need for post-processing. External influences, difficult to control in conventional processes, are automatically compensated. The computer-aided control system permits also a simultaneous data evaluation for quality assurance.
"Towards new frontiers"

The ASTRA Research Reactor, the only high-performance neutron and irradiation source in Austria, has been in operation since September 1960 - hence for about a third of a century. During its lifetime, profound changes have taken place in society as a whole, and in research policy in particular.

Thus, it seemed to be high time to reconsider the position of this landmark facility in the landscape of Austrian research. For this purpose, a discussion with the "scientific community", i.e. the users of the facility, and the competent authorities was organized in the autumn of 1993.

The participants expressed a keen interest in the continued availability of the reactor for R&D activities in a number of fields, such as medicine, agriculture and industrial technology. There was widespread concern that the high level of scientific work might otherwise not be maintained, and that important research projects, including the development of new, short-lived radio-pharmaceuticals, might not be continued.

Together with the Department of Agricultural Research and Biotechnology, the Centre succeeded, for the first time, in obtaining a contract for a period of several years aimed at the development of new ways of re-using highly polluted sewage sludge. Analytical processes, such as the determination of chlorinated hydrocarbons in water, as well as test methods in the field of polymer chemistry provide the basis for the continuation of the current activities as a testing institute.
PRODUCTION FACILITIES TAILORED MADE BY THE COMPUTER

Lower costs, diminished risk: accurate planning of complicated manufacturing processes through simulation models

Computer simulation is being used more and more widely for the planning of production facilities and processes. The method is gaining in importance for the economy, since it considerably reduces testing costs and helps to optimize manufacturing processes.

The Seibersdorf Research Centre develops tailor-made solutions for its clients. In one particular case, a plant was set up for the processing of aluminium bolts. Capital expenditure was to be kept as low as possible.

To meet this objective, the new plant had to be designed to operate in perfect agreement with the upstream press. By means of computer simulation, it was possible to study the maximum capacity of the individual machine components under different manufacturing conditions and to define peak loads as well as capacity limits for each individual operation. Thus, the new plant was designed to meet the operational requirements of the production process with optimal efficiency.

A wide range of applications

Computer simulation can be used for a wide range of applications in a company, including not only the planning of manufacturing processes, but also the monitoring of day-to-day operations. In the case of machine failures, the operator can instantly take the right decisions. The programmes are also suitable for the modelling and simulation of chemical processes.

The method proves to be particularly useful in the ecological field, above all for in-plant environmental analyses. Any measure intended to lower energy consumption, avoid the generation of waste or diminish the input of raw material can be tested thoroughly on the computer before its practical implementation.
A GUIDE TO THE TECHNOLOGIES OF THE FUTURE

A comprehensive sectoral analysis facilitates the transition to environmentally friendly technologies

In recent years, the Seibersdorf Research Centre has continuously widened its range of services for industrial companies in Austria. The elaboration of an overall strategy for the metal-finishing industry is yet another step in this direction.

For the first time, an up-to-date environmental-technology "guideline" is to be worked out, containing detailed sectoral analyses and recommending state-of-the-art corrective measures. The guidelines are to help all companies planning to retrofit old facilities or introduce new processes on the basis of the 609th Waste Water Emission Regulation.

For the purposes of the "sectoral strategy for the metal-finishing industry", a survey will be carried out to establish the potentials of avoiding and recycling effluents and waste generated by surface-treatment procedures. The necessary data are obtained through an analysis of the current situation in these companies. A survey of recent developments in national and international environmental legislation completes the information.

This ambitious research project is undertaken in cooperation with the sectors of industry concerned, the Federal Environment Agency and the Federal Ministry of Environment, Youth and Family. This "Austrian model" (see Figure) is based on the principle of eco-efficiency. Intended to harmonize measures taken with regard to water/waste water and residual substance/waste issues, it considers the existing range of recycling, treatment and disposal options and permits the:
- reduction in the quantity of waste,
- utilization of recycling potentials,
- safe landfill disposal of residual waste.

The strategy enables companies to ensure safe disposal of their waste, provides them with reliable, long-term planning and siting options, and thus strengthens their competitiveness.
HIDDEN FLAWS MADE VISIBLE

In neutron radiography, elementary particles penetrate to the atomic nuclei of the objects to be examined.

Ozone depletion is one of the gravest environmental problems of our time. Researchers all over the world are working on the development of new and ecologically compatible cooling agents. However, some of these substitute agents, although appearing to be quite suitable at first sight, have hidden deficiencies, which can hardly be detected by conventional means.

Neutron radiography, a highly advanced technology developed within the framework of a joint Austro-Hungarian project carried out at Seibersdorf’s ASTRA reactor, brings such hidden deficiencies to light.

It took a neutron radiogram to detect some of the disadvantages of R-134a, a new cooling agent substitute: traces of oil from the compressor are deposited on the surface of this organic substance, which impairs evaporation and diminishes the performance of the refrigerator. Similar studies have also been made on heat exchangers, heat-exchanger tubes and multiple-disk clutches.

Neutron radiography is a special procedure which relies on elementary particles, i.e. neutrons, to act as "probes". Being electrically neutral, the particles penetrate deep into the material to be examined and interact with the atomic nucleus of the sample to be tested.

The image obtained is in a sense complementary to the usual X-ray and gamma images. While neutrons pass easily through substances of high mass numbers, such as metals, they are strongly attenuated by compounds containing hydrogen, for example oil or water. Thanks to this property, internal flow patterns and filling processes which could not be detected by means of conventional procedures can be traced in equipment during operation.
ENGINEERING

"Partners in a united Europe"

Our clients expect us to develop technologies that enable them to manufacture less expensive, higher-quality or entirely new products. We approach this problem on the basis of our main asset - our human resources and know-how in the fields of manufacturing technology, materials technology and energy technology.

We design fundamental concepts for specific manufacturing tasks and develop appropriate hardware and software components, automated special machinery, sensor-assisted handling systems and intelligent systems for quality control. By flexible integration of these components, manufacturing facilities are built that enable companies to react immediately to changing market situations. The early detection of manufacturing errors not only helps to meet delivery deadlines and quality requirements, but also saves time, raw materials, consumables and energy.

Innovative products require appropriate materials and appropriate processing technologies. We test application-specific material properties and assist Austrian companies in improving conventional materials and developing new ones.

We participate in international projects concerning, inter alia, new materials, energy technology, recycling and material characterization:

- ESA Test House of material characterization under outer-space conditions
- development of new materials for steam turbines
- recycling of electronic scrap.

WORKING AREAS

- Technology of new materials
- Space materials technology and testing equipment
- Materials characterization
- Calibration facilities for heatmeters
- Safety and environmental technologies
- Energy technology
- Integration techniques in manufacturing
- Automated manufacturing
- Automatic quality test systems
- Mechanical workshop
GAINING A HEAD START THROUGH QUALITY CONTROL

Seibersdorf develops innovative methods for companies preferring tailor-made solutions

In order to succeed in the face of tough competition, not merely today but also in the future, a company has to make every effort to cut the amount of rejects in production. Quality control is an effective instrument to ensure low-fault manufacturing.

The Seibersdorf working group on "Automation in Quality Control" develops tailor-made solutions for areas not covered by the commercial sector and makes its know-how available to clients facing the following tasks:
- development of measuring procedures and sensors
- image processing by means of various camera techniques
- documentation for the purposes of quality assurance.

The range of services offered extends from consultancy to feasibility studies to the installations of entire systems.

Instant solution

A company in Lower Austria manufactures light-metal die-cast parts. To automate their manufacturing plant, they were looking for a non-contact sensor system to check the parts for the presence of a thread. Seibersdorf engineers took no more than six hours to discuss the problem on site, perform laboratory tests on a number of sensors and present the results to the client.

Feasibility study

A company in the Province of Vorarlberg manufactures pipe fittings of different diameters. They were looking for a flexible non-contact measuring system to verify the outer dimensions of the parts. In the course of a six-week study, the Seibersdorf team succeeded in designing a method enabling a fully automatic inspection of the parts by means of electrically adjustable video cameras, image processing and appropriate sample manipulation.
NEW DIMENSIONS IN POWER PLANT CONSTRUCTION

The development of high-strength steel grades prepares the ground for the power generation systems of the future

In theory, power plants could be made more environmentally compatible even on the basis of present-day technology. Much more energy could be generated per ton of fossil fuel, which would result in a substantial reduction of pollutant outputs. At the same time, the amount of dust separated from the exhaust gases through filtration, which currently adds to the volume of hazardous waste, could be diminished.

In practice, however, these targets are not achieved for lack of suitable materials. To increase the energy efficiency of the fuel used, the new generation of power plants will have to operate at temperature levels of between 550 and 600 °C. Hence, the steam pressure inside the plant will increase from 180 to 300 bar. However, in the long run, the steel grades currently used in power plant construction are not able to resist the enormous, additional mechanical thermal and corrosive stresses.

The Seibersdorf Research Centre participates in these worldwide developments within the framework of the international "Metallography and Alloy Design Group".

Owing to the increase in temperature and pressure, rotors, rotor casings and blades are subject to greater stress. The new materials are based on high-temperature ferritic 9-12% chromium steel. The use of chromium as an alloying constituent guarantees a satisfactory level of high-temperature corrosion resistance. Micro-structural changes due to fatigue stress are systematically analyzed under the electron microscope.

The results of these studies provide the basis for the production and testing of steel grades optimized for use in power plant components within the framework of the third round of the European COST 501 operation. The Austrian participants in the programme are VOEST-Alpine Stahl Linz, Böhler Kapfenberg, Austrian Energy & Environment and the Department for Materials Science and Welding Technology of the Technical University of Graz. In view of the planned accession of Austria to the EU, cooperation with European partners is gaining in importance.
EFFICIENT ENERGY UTILIZATION

A new method of testing heat meters reduces manufacturing time and costs by as much as 50%

Many Austrian households are connected to district-heating networks. To raise consumer awareness of the need for energy conservation through accurate measurements and continuous monitoring, special district-heat meters have been developed.

Before installing the meters, the utilities have to test and calibrate each unit in a time-consuming procedure, which results in a considerable cost increase.

The Seibersdorf Research Centre has developed a modern method, which cuts the time taken for testing and calibration by half and reduces the costs incurred by as much as 50%. The first installation of this type was started up at STEWEAG, a utility in the Province of Styria, in 1993.

A conventional heat meter consists of a volumeter, a temperature sensor in both the forward-flow and the return circuit, and a computing device. Until recently, each of these components had to be tested separately for want of a more efficient method.

The new system designed at Seibersdorf tests these components in a single set-up. It can be used to calibrate not only all types of heat meters currently in operation, but also old models and newly developed units.

The new installation is controlled by an intelligent testing interface, permits data transmission to a central computer system for meter administration, and ensures high-precision temperature simulation through ultra-stable precision baths. Bath changes for different temperatures, level checks and system parameter documentation are also performed automatically.
"Successful in international cooperation"

The regions of Europe are cooperating more and more closely at all levels. Our own activities in the field of environmental research have been guided by a consistent policy of internationalization. Last year, our involvement in European research initiatives proved to be a remarkable success. Of fourteen projects submitted for the third EU framework programme, five have been approved so far. Thus, the scope of our international activities will be widened considerably in the years to come.

Our cooperation projects within the framework of the EU mainly focus on research in the fields of radiation protection, biotechnology, biomedicine, agricultural science and environmental analyses. Our radiation protection experts play a leading role in the establishment of European standards and the standardization of high-frequency measuring techniques for protection against non-ionizing radiation. Laser safety is another issue of growing importance. It is being pursued within the framework of a EUREKA project.

Our participation in an EU biotechnology project is the result of many years of preliminary work by Seibersdorf experts: currently, molecular-biology methods are being developed at Seibersdorf for the genotyping of forest plants on a European scale. Within the framework of another EU cooperation project, members of our agricultural research unit are contributing their detailed knowledge on the behaviour of soil pollutants.

In the field of toxicology, we have been able to consolidate our expertise in long-term toxicology tests. Through our participation in international inter-laboratory tests, we have been continuing our efforts to develop alternatives to animal testing. At the national level, our 1993 research activities focused on water quality examinations in Austria and the investigation of the effects of pollutants on the human immune system.
POLLUTION DOES NOT STOP AT THE BORDER

Joint European project for the protection of the Alps - Seibersdorf Research Centre analyzes the causes of air pollution

For an eco-system as vulnerable as that of the Alps, cross-border air pollution constitutes a special hazard. Depending on wind conditions, mountain regions suffer either from "home-made" pollution or from pollutant loads originating in neighbouring countries.

The European ALPTRAC Research Project, initiated by Austrian scientists, is intended to preserve and protect this unique natural landscape. The objective of the project is to obtain reliable data on the threat to high-altitude regions through acid precipitation.

Snow serves as a natural storage medium for pollutant loads. The layered structure of frozen snow provides accurate information on the build-up of pollutants in the past. Seasonal fluctuations can also be detected. The interpretation of these data is supported by meteorological studies and air-chemistry measurements.

Analyses of drill cores from the glaciers of the Monte Rosa region clearly point to an increase of air pollution since the beginning of industrialization. Given the growing volume of transit traffic, these studies are of the highest topical importance.

Within the framework of the Seibersdorf sub-project, minor variations in the isotopic composition of sulphur, nitrogen and carbon are determined. By means of this method, it is possible to estimate the extent to which the pollutant burden is of natural or man-made origin.

The study draws on the fact that different groups of emissions are characterized by different isotope conditions. Using a special mass-spectrometry technique, the researchers are able to assign the isotopes, comparable to finger prints, to the corresponding groups of emissions.
SAFETY IN LASER TECHNOLOGY

High-performance laser systems hold greater risks for users - Seibersdorf investigates potential sources of danger

There are two sides to the enormous progress made in the field of laser technology - as there are in any technological development. On the one hand, modern laser systems offer the advantages of a higher output, increased precision and an ever wider field of application - from eye surgery to the welding of steel, several centimetres thick, for ship-building. Currently, the world’s strongest laser source has an output of 50,000 W, which is equivalent to the energy of a thousand light bulbs directed at a single point.

On the other hand, the user is exposed to a higher risk, unless appropriate safety precautions are taken. In fact, new sources of danger may develop which are not yet fully understood. High-output units of this type, generating acutely focused light beams from the ultraviolet to the infrared wave range, are used more and more widely in data-processing, medical, telecommunication, measuring and manufacturing applications.

Hence, the issue of laser safety has come to receive considerable international attention. Within the framework of a European research project, EU-643 Laser Safety, scientists from Seibersdorf have embarked upon first investigations of safety-relevant aspects in cooperation with the Institute for High-Output Beam Technology in Vienna. These investigations focus on three problem areas:

- UV radiation
- ozone formation
- interfering radiation in the high-frequency range.

In addition, the "SAFELAS Testing and Research Institute for Laser Safety" has been established at Seibersdorf. Given the considerable importance of industrial laser applications, high-output beam technology has been included as a priority issue in the new technology-policy concept of the Austrian Federal Government.
THE KEY TO GENETIC VARIETY

With the help of molecular biology the chances of survival of endangered tree species can be analyzed.

The great variety of tree species in European forests is in serious danger. Changes in climate, environmental pollution and human activity have an adverse effect on ecosystems. They restrict the habitat of animals and plants and diminish their reproductive potential. According to many scientists, this creates a vicious circle: the genetic variety of species is diminished, which in turn reduces their adaptability to changing environmental conditions.

Through their experiments on forest trees, the Seibersdorf team of biotechnologists hope to contribute towards preserving the variety of species in our forests. Their involvement in a biotechnological project of the European Union underlines the importance attributed to their efforts also at the international level.

Forest tree species are particularly endangered, since the process of genetic adaptation is extremely slow due to their long life cycle. Hence, it is essential to decode their genetic variety and draw up a scientific inventory.

The molecular-biology methods developed in the Seibersdorf laboratories enable the researchers to identify the variability of oak and spruce stands on the basis of their genetic material, i.e. the DNA. For genotypical patterns to be assigned to phenotypical characteristics, polymorphic sites need to be identified in the DNA. The techniques applied include DNA fingerprinting, highly variable satellite DNA and random-amplified polymorphic DNA (RAPD).

The methods developed at Seibersdorf are used within the framework of the EU project to draw up a complete inventory of the remaining variety of species in the European forests. Finally, measures are to be taken at the Community level to preserve existing tree stands.
"New opportunities through advanced technologies and strategic environmental protection"

The importance of new technologies for the competitiveness of companies, the development of regions and the comparative advantages of a country in international competition is beyond any doubt. However, technological progress itself may cause serious problems for innovative companies. New technologies may not only diminish the value of the productive output of individual companies, but make entire sectors of industry obsolete.

Environmental damage caused by new technologies, combined with a growing awareness of ecological issues in society, have changed the focus of industrial production and led to a growing emphasis on low-polluting production methods, clean technologies and recycling.

Our fast-changing environment calls for system-oriented concepts, strategic designs and targeted measures. Hence, the Systems Research Division deals with the development of models for empirical technology and environmental research. Our services cover a wide range: we perform environmental impact assessments, develop strategies for regional development, and act as consultants in the fields of technological innovation and environmental policy.

The outstanding know-how of our team has been in high demand in recent years, not only in industry, but also in public administration and among policy-makers. We intend to consolidate our position - for the benefit of Austrian companies and regions faced with the challenges of advanced technology. We point out ways and means of making use of economic opportunities while, at the same time, pursuing a reasonable policy of strategically oriented environmental protection.
NEW APPROACHES TO TECHNOLOGY POLICY

On behalf of the OECD, Seibersdorf analyzed which policies are best suited to promote the rapid dissemination of new technologies.

What makes companies adopt newly developed technologies and which factors are decisive for their dissemination within a national economy? Is there a way to influence these factors at the political level? Answers to these questions provide the basis for an economically successful technology policy.

Having studied these issues, the Seibersdorf Research Centre arrived at the following conclusions: it is not primarily the availability of technologies, but their adoption by individual companies that determines whether or not an innovation succeeds instantly and becomes widely accepted throughout the economy. A company's adaptability, in turn, depends on its willingness to cope with organizational change, to develop appropriate corporate strategies and to cooperate with other companies or research institutions.

The study, which was performed by the Seibersdorf Division for Technology Research on behalf of the Organization for Economic Cooperation and Development (OECD), contains a detailed evaluation of the success of various political programmes aimed at promoting the use of information technologies in small and medium-sized companies in thirteen countries.

Some countries, including Austria, have already taken measures to improve the ability of their companies to adopt new technologies. Among other things, the Innovation and Technology Fund (ITF) has set up a priority programme on "flexible computer-integrated manufacturing" (FlexCIM), which proved to be an efficient instrument by international comparison.
DECIDE FAST AND ACT EVEN FASTER

Strategic corporate planning to secure a competitive advantage

Seen within the framework of their economic environment, companies are highly complex systems - too complex for many to cope with the fast-changing conditions of the market without external assistance.

Strategic corporate planning enables many companies to develop future-oriented policies and thus to react efficiently and in a targeted manner to changing conditions. In order to support the Austrian economy in the introduction of effective management instruments, the Systems Research Division has begun to elaborate methods of integrative strategy development.

For any strategic corporate planning to succeed, it must be based on a holistic approach. Thus, social and ecological issues, which would otherwise be subordinate to economic and technological aspects, are given greater prominence. From the company’s own point of view, the most important thing is to respond effectively to changes of political conditions, to the globalization of markets, to increasing competition and to technological challenges.

Strategies evolve against the background of a vision, a guiding idea. In integrative strategic planning, a policy based on substantive priorities and principles for future action is worked out in cooperation with all those concerned. The process involves four major stages: identifying the target, assessing the current situation, developing a scenario, and introducing strategic management.
THE BEAUTY OF NATURE REFLECTED IN SIMULATION MODELS

Visibility studies help to assess the effects of the intrusion of technology on the natural landscape

In recent years, plans for major technical projects affecting the physical appearance of the landscape, such as mining operations, have been accompanied by visibility studies. The Environmental Planning Department of the Seibersdorf Research Centre has developed a computer-aided method to simulate the dynamics and the visibility effects of measures which alter the natural landscape. For the first time, the AVS visualization programme has been linked with the ARC/INFO geographical information system. The method is based on a digital terrain model and an orthophoto of the area under investigation. With the ARC/INFO system the digital terrain model is transformed into a three-dimensional landscape model, which can then be modified according to the measures to be taken and their effect in the course of time. The resulting time series of landscape models is entered into the AVS visualization programme and super-imposed on the orthophoto.

The method thus generates images of the landscape as seen from different locations in the neighbourhood. Through computer animation, the chronological sequence of changes can be represented like a film. The image shown here has been generated by this method within the framework of an environmental impact assessment carried out for the proposed mining operation at Draxlerkogel near Peggau/Styria planned by the local cement works.

Site after 5 years' mining
MARKETING

"A professional service for all those entering into new markets"

Customer-orientation and internationalization in European research call for ever more efficient marketing instruments for new technologies. The Marketing Division of the Research Centre meets these demands by focusing its activities more strongly on direct bidding and project support.

Even today, more than 50% of our marketing capacity goes into services rendered to the five operational divisions, i.e. contract research. Only 20% is accounted for by infrastructural services, such as library management, public relations, internal training, attending to visitors, public events and project management. Almost one third of the Division's capacity - two thirds, if projects under special financing arrangements are included - is taken up by contract-based activities.

The most important activities of the Marketing Division in 1993 included the reorganization of internal procedures, the introduction of streamlining measures, the establishment of a quality management system, intensified sales support, and the development of an international service offer for the five operational divisions. The exchange of experience within the ISC Forum confirmed the usefulness of our system of centralized/decentralized marketing. In fact, the Seibersdorf marketing model has already served as an example for a number of partner institutions abroad.

In addition, the Marketing Division completed a comparative analysis of European research institutions, assumed the chairmanship in an international marketing working group, finalized the work of a study group on the reform of the Austrian Federal Railways, and participated in a feasibility study on the creation of EUROCRYST, a large-scale European research centre. Numerous lectures and publications as well as measures related to the new corporate design of the Research Centre completed the activities of the Marketing Division.
MARKETING AT THE EUROPEAN LEVEL

A streamlined organization and an improved work flow ensure international success

Internationalization was the overriding principle for the activities of the Marketing Division in 1993. To make the Research Centre even more efficient in its external relations, its internal structures were streamlined and its organizational procedures further improved.

The guideline on project implementation was revised to ensure a smooth work flow. With a view to the introduction of quality assurance according to ISO Standard 9001, the necessary instructions were elaborated for the individual procedural steps - from bidding to project completion. To create favourable synergies, central project-support tasks were assigned to the technology transfer unit. Within the framework of its international service, the Marketing Division offers detailed information on projects of the European Union, application modalities and legal standards. Since application for participation in EU projects requires intensive preparatory activities, special funds have been made available for this purpose by the Federal Ministry for Science and Research.

As regards order acquisition, the Division submitted more than 700 quotations and handled 250 incoming orders and more than 1000 minor projects. The activities of the technology transfer unit included contacts with 320 companies, work on 75 R&D projects, market surveys and responses to 120 customer enquiries. The Research Centre was also represented at numerous trade fairs.

The activities of the Information and Documentation Department included the creation, maintenance and utilization of national and international databases. A growing number of contracts were received from Austrian and international organizations. The training centre organized approx. 180 courses for 2500 participants. New courses were introduced in the fields of environmental protection and quality assurance. Further technical training was offered for commissioned officers of the Austrian Federal Army.
FOCUS ON COMMUNICATION

Impressive media coverage for Seibersdorf Research Centre - two to three daily news items

Any marketing activity focuses on communication with clients. Among the large variety of instruments used for this purpose, an active policy of media relations has proved to be the most effective of all.

Hence, the Research Centre intensified its public relations work during the year under review, directing it not merely at potential industrial customers, but also at public-sector decision makers, the media, and the public at large.

Public-relations work helps to create an unmistakable image

A company's own staff is a valuable link in the chain of communication and forms part of the public to be addressed. Hence, the Centre's internal newsletter, "Seibersdorf intern", was given a facelift and increased in volume.

Our public relations work included four issues of the Seibersdorf News within the framework of the AUSTRIA INNOVATIV Magazine. 32 press agency releases, an annual press review, 10 internal press reviews, 4 press releases in German and English, and frequent contacts with the specialized press in response to more than 50 enquiries.

The Centre's intensified public relations work has had a remarkable effect: more than 800 news items in Austrian newspapers and magazines in the course of 1993, and 25 reports broadcast on Austrian radio and television. Compared with previous years, there has been a noticeable change of emphasis in the reporting: nine out of ten reports underlined the modern, application-oriented and interdisciplinary approach of the Seibersdorf Research Centre. These features are also attracting attention abroad, as can be seen from the large number of enquiries received from countries in Europe and overseas.
The public at large understands and appreciates the achievements of the Research Centre

As in previous years, a survey was carried out in 1993 to establish the extent to which the Austrian population is aware of the Research Centre and its activities. The results of the survey show that our intensified public-relations efforts have not remained without effect. A brief comment by A. Kirschhofer-Bozenhart of the IMAS Institute in Linz: "The results obtained show that the Austrian population is well-disposed towards the Seibersdorf Research Centre, which it regards with considerable respect."

Here are some details from the survey: 80% of the Austrian population - a record figure - have heard of the Research Centre. 88% of all employees in executive positions know about Seibersdorf. In the Provinces of Lower Austria and Burgenland the figure is even higher, i.e. 92%. Seibersdorf's contribution to the Austrian economy is perceived as very positive: 43% of those questioned attribute a high value to the Research Centre's contribution to the Austrian economy.

Seibersdorf's role is perceived as becoming even more important upon Austria's accession to the European Union: a clear majority of 41% - against 15% - are convinced that Seibersdorf is in a position to enhance the competitiveness of the Austrian economy.

When asked to position Seibersdorf in an international comparison, the public at large (49% : 14%) ranked Seibersdorf as equivalent to other European research centres, a finding which has also been confirmed by international analyses.
BUSINESS ADMINISTRATION

"Successful structures to be consolidated and improved"

The Seibersdorf Research Centre regards itself as a modern, market-oriented and innovative enterprise. Successful management structures need to be continuously consolidated and improved. Hence, the year under review was marked by cost-cutting efforts and the introduction of a quality assurance system.

The Research Centre presented its 1993 balance sheet in accordance with EU accounting rules. Itemized cost accounting has been automated and incorporated in the balance sheet. Moreover, modern software tools have been introduced to draw up target balance sheets and to carry out rolling budget planning.

An internal analysis of overheads indicated a considerable potential for further savings, which are to be achieved by the end of 1994. Staff costs have already been reduced substantially - qualified staff members enjoy greater inter-departmental mobility, and vacancies due to retirement are not refilled.

Procurement costs have also been reduced considerably through the conclusion of long-term contracts. Waste avoidance and separation measures have enabled us to contain our waste disposal expenses.

Thanks to the outstanding personal commitment of our staff, it was possible to introduce a quality management system within a remarkably short time. For such a system to be uniform and simple to implement, detailed adjustments are necessary. Procedural instructions and guidelines were drafted and updated with this requirement in mind. The corrective measures identified in internal audits have already been taken and the basis for certification according to ISO 9001 was finalized in the first half of 1994.

WORKING AREAS

- Personnel strategies
- Personnel accounting
- In-house medical service
- Financial accounting
- Fixed assets management
- Financial planning
- Cost accounting
- Project monitoring
- Procurement
- Central services
- Planning, installation, provision and maintenance of infrastructure
INVESTMENTS IN INFRASTRUCTURE

Continuous renewal and improvement of research facilities as an integral part of Seibersdorf’s corporate philosophy

Construction of technical installations for the disposal of low-activity wastes was begun in spring of 1993. The facility will consist of a large multi-purpose hall, a workshop for the processing of contaminated items and plant components, and a decontamination room for the cleaning of contaminated containers and other equipment.

Construction work was begun on the new building for the Systems Research Department, designed by the COOP-HIMMELBLAU team of architects.

Radio-pharmaceuticals, produced at the Seibersdorf Research Centre since 1975, are supplied to the nuclear-medicine departments of several hospitals on a daily basis. In view of the growing demand and the changing legal requirements concerning radiation protection and the production of pharmaceuticals, a new development and production facility for radio-pharmaceuticals and other therapeutic agents had to be set up. The new building, to be opened in autumn of 1994, consists of a number of laboratories type-tested according to the Act on Radiation Protection and built in accordance with the most recent clean-room guidelines. Rehabilitation of the Chemistry Department at a total cost of approx. AT 10 million was completed.

Other maintenance and repair measures concerned the following facilities:

- Research greenhouse
- Engineering Division: preliminary planning of rehabilitation
- Step-by-step rehabilitation of stop valves in the water supply system
- Preparation of connection to Lower Austrian Water Supply Network
- Modernization of a building acquired by the Research Centre to accommodate toxicological laboratories

Reconstruction of the tank serving the water supply of the Research Centre
ECO'NU'MIC
DEVELOPMENT

Continuing on a successful course

Thanks to its market-oriented research policy and the quality of its expertise, the Research Centre was able to maintain its successful course in the year under review.

To secure the conditions required for long-term success, the Centre has been pursuing a consistent policy of investment and of modernization of its scientific and technical infrastructure since 1992.

It is most gratifying to note that in spite of the recession in Austria and throughout Europe, revenues from R&D contracts and other services have increased far in excess of our medium-term planning target.

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<tr>
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<tbody>
<tr>
<td>Total staff as per 31 December (full time equivalent)</td>
<td>545</td>
<td>532</td>
<td>523</td>
</tr>
<tr>
<td><strong>Structure of balance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity capital</td>
<td>226.491</td>
<td>267.124</td>
<td>287.705</td>
</tr>
<tr>
<td>Social capital</td>
<td>141.998</td>
<td>222.733</td>
<td>248.740</td>
</tr>
<tr>
<td>Borrowed capital</td>
<td>297.821</td>
<td>255.629</td>
<td>263.424</td>
</tr>
<tr>
<td>Balance sheet total</td>
<td>666.310</td>
<td>745.486</td>
<td>799.869</td>
</tr>
<tr>
<td>Investment in tangible assets</td>
<td>48.387</td>
<td>105.356</td>
<td>93.774</td>
</tr>
<tr>
<td><strong>Structure of income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contribution to operating costs from partners</td>
<td>12.780</td>
<td>12.780</td>
<td>12.840</td>
</tr>
<tr>
<td>Contribution to operating costs from Federal Ministry of Science and Research</td>
<td>246.321</td>
<td>246.321</td>
<td>250.920</td>
</tr>
<tr>
<td>Technology priorities fund of Federal Ministry of Science and Research</td>
<td>17.000</td>
<td>11.230</td>
<td>11.351</td>
</tr>
<tr>
<td>Income from contract-based research</td>
<td>227.879</td>
<td>277.506</td>
<td>286.851</td>
</tr>
<tr>
<td>Other income</td>
<td>46.275</td>
<td>54.497</td>
<td>51.398</td>
</tr>
<tr>
<td>Total income</td>
<td>550.255</td>
<td>602.334*</td>
<td>613.360*</td>
</tr>
</tbody>
</table>

*excl. aperiodical income
January
Seibersdorf performs air measurements to establish the dissemination of waste air from the Plabutsch Tunnel in Graz.

February
GLP (Good Laboratory Practice) inspectors of the OECD inspect the Toxicological Department of the Research Centre.

March
Seibersdorf welcomes
- Federal Minister Mag. V. Klima
- Municipal Councillor Dr. J. Rieder
- the environment ombudsmen of Lower Austria, Upper Austria and Styria.

Participation in C-DIALOG at the Vienna Institute for Economic Promotion

April
Opening of a competence centre for material characterization at Seibersdorf

Presentation of the "International Comparison of Industry-Related Research in Europe" in the Federal Ministry of Science and Research

For the twelfth time, Seibersdorf participates in the Hannover Fair.

May
Delivery of a compact heat-meter test stand to STEWEAG, Graz

Start of construction of the new facility for the disposal of low-activity waste financed by the Federal Government

June
Start-up of trial operation of the sterilization unit, officially opened by Dipl.Ing. Michael Salzer, President of the Lower Austrian Section of the Confederation of Austrian Industrialists

The Seibersdorf-run Leoben Technology Transfer Centre participates in TECHNOVA International, Graz

International Workshop on Metal-Ceramic Composite Structures, Vienna, in cooperation with Taiwan

Start of construction of the new building for the Systems Research Division, designed by COOP-HIMMELBLAU

July
Foundation of a Laser Safety Testing and Research Association
CHRONICLE 1993

August
The Seibersdorf-designed ion sources on the Japanese GEOTAIL satellite complete their first year of trouble-free operation.

Workshop on railway technologies, co-organized with the Taiwanese Vice-Minister of Transport

Alpbach Technology Symposium, co-sponsored with the Confederation of Austrian Industrialists, Vienna Section

September
Information meeting on the further utilization of the ASTRA research reactor

October
Heads of Divisions present their working programmes at a meeting of the Supervisory Board.

First ESPRIT Project, OMHEGA, on multimedia/hypermedia - the result of a long international partnership

Participation in INTERTECH BODENSEE, Dornbirn, and UTEC-Absorga, Vienna

According to an IMAS poll, a record 82% of the Austrian population have heard about Seibersdorf.

November
Participation in the international IKAL+DENTAL Fair in Vienna

Delivery of newly developed products:
- Environment-oriented computing centre for thermal power plant in Zeltweg, Styria
- Moisture metering unit to control concrete mixing for the Freudenau power plant at the River Danube
- Air sampling device designed on behalf of the EU

December
Preliminary quality management audit by the Austrian Association for the Certification of Quality Assurance Systems
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Austrian Industries Aktiengesellschaft

Vice-Chairman
Sektionschef Dr. Norbert Rozsenich
Federal Ministry of Science and Research

Vice-Chairman
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Vorstandsdirektor Dipl. Ing. Ernst Tutschek
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