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EAST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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ROMANIA

PATON INSTITUTE EXPERT ON GDR-USSR WELDING RESEARCH

East Berlin BERLINER ZEITUNG in German 16-17 Mar 85 p 3

[Interview with Vladimir Ignatyev, expert at the Paton Institute for Electric Welding, by Dieter Resch; date and place not specified]

[Text] Under the motto "40 years of victory--40 years of peaceful labor" the Soviet Union's exhibit at the Leipzig Fair has been a magnet for visitors. Also because there is a lot to be seen which was created in joint efforts by researchers of our two countries and which has been carried over into production. Vladimir Ignatyev, an expert from the world-famous "I. O. Paton" Institute for Electric Welding, has been giving information to a specialist public regarding interesting new developments. We had a conversation with him.

[Question] "Paton Institute"--that is a name with a good ring to it in the technical world. Like the name of the Central Institute for Welding Technology (ZIS) in Halle. Do the two work well together?

[Answer] Anyone familiar with international developments in our area is aware of the effect of our two institutes upon scientific-technical progress. Here in Leipzig this is clearly evident, for example, in the semiautomatic "Intermigmag." This facility for CO_2 welding represents a new level of steel welding quality. It arose from the cooperation of researchers and producers in the USSR, the GDR and Bulgaria. In all three countries it is being already mass produced, with the welding arm and all the feed apparatus coming from the GDR.

[Question] There is also a big program for the coming years. What is anticipated?

[Answer] Within the CEMA we are working together on a total of 17 research topics. Five of these are under the supervision of ZIS Halle, nine under the supervision of our institute and others are being run by research facilities in other CEMA countries. These include entirely new methods of bonding the most varied materials.

[Question] Among the front line achievements which Paton is showing at the fair there are methods of electron-beam welding which are entirely new. What do they accomplish?

[Answer] It is by no means presumptuous for me to say that our institute is the worldwide leader in this area. Thus we are exhibiting here an apparatus which makes it possible to bond together metals which by traditional methods could not be welded to one another. The same applies to hardened steels. Just to mention a few effects of this: ball-bearing cages, in the form in which they are also manufactured in the GDR, can be produced with our UL 115 facility 8 to 10 times faster than formerly. The method of welding is called multipoint welding by electron beam. With another model (UL 101) in transport machine construction it is possible to increase labor productivity sixfold. All of these devices have been tested in the Soviet Union in practical production and are being mass produced by the industry.

[Question] You yourself are a specialist in aluminum bonding. In your opinion what is the decisive factor in new products?

[Answer] The only decisive question is just how economically the process or the equipment works. It often happens that patents are applied for--and this as is well known costs a lot of money--for an idea which does not produce really good economy. That is not our goal. To put our ideas to best use for socialism means to achieve the highest productivity. This results in progress.

[Question] On the basis of what criteria does your institute develop new approaches?

[Answer] There are at least two decisive ones. One is the requirements of the institute. Specialists often come to us because they cannot see their way to the end of some technological problem. We give them help. On the other hand we naturally proffer our technical and technological solutions. If they are widely usable then our planning commission decides that plants in the electrotechnical/electronics field shall mass produce them. If their usefulness is confined to only one branch of industry then that branch is commissioned to produce these facilities itself. Naturally, we in the institute can only offer models or prototypes.

[Question] What significance does the Leipzig Fair have for you?

[Answer] Nowhere else is there so much activity in expertise and technical knowledge. For example, on the very first day of the fair I had to answer countless questions on the subject of diffusion welding. For the development and introduction of this welding process under vacuum our institute last year was honored with the Lenin Prize. Using this method it is possible to weld together such diverse materials as ceramics and metal, silver and nirosta or tungsten and steel. That is something unique.

8008
CSO: 2302/68

CZECHOSLOVAKIA

INTERNATIONAL COOPERATION IN SPACE EXPLORATION

Prague TRIBUNA in Czech 27 Mar 85 p 15

[Article by Ivana Balkova: "Interkosmos"]

> [Excerpts] Interkosmos is one of the best known joint agencies of the Council for Mutual Economic Aid [CEMA]. This is the short title of the Council for International Collaboration in Research on and Utilization of Outer Space, founded in May 1966 under the USSR Academy of Sciences. The founding of Interkosmos as a joint agency of CEMA also broadened the bases of scientific and technological collaboration among the member countries of the Council.

The fundamental agreement on founding this organization dates from the 1965 conference of representatives of socialist countries held in Moscow. At this meeting, the Soviet Union made participating countries an offer of free rocket technology for joint peaceful space research. Several years later, after the organization had already been established, in October 1969, the first of the Interkosmos satellites, a joint effort of scientists from the Soviet Union, Czechoslovakia, and East Germany, was set into orbit around the earth. This marked the beginning of a stage of multi-lateral, rationalized and extensive cooperation among the socialist countries in space research and in long-distance research of our planet from space.

One year after this program was initiated, a new and more extensive agreement on the Interkosmos joint program, involving a qualitatively new area of collaboration, manned flights with an international crew, was approved in Moscow during the council of presidents of national coordinating agencies. This agreement, which called for long-term international collaboration within the framework of the Interkosmos organization was signed by Bulgaria, Czechoslovakia, Cuba, Hungary, Mongolia, East Germany, Poland, Rumania and the Soviet Union. In 1978 the Vietnamese Socialist Republic was added to the list.

These are all member countries of Interkosmos. The primary projects are organized and coordinated by five permanent working groups devoted to the following principal general topics--space physics, satellite communications, meteorology, biology, and medicine. The most important area of collaboration has continued to be study of the earth using aerospace research methods. Such programs are also a part of manned flights with international crews.

The Interkosmos programs are providing the member countries with invaluable information of great importance to the national economy. In recent years, for example, improved weather forecasting using information provided by meteorological satellites has been saving approximately one billion rubles a year in material value alone. The methods of space meteorology are being perfected, and are highly promising within the framework of the Interkosmos program.

The youngest branch of this program is long-distance research on our planet from space. In accordance with the requests of the individual socialist countries, satellite flights include programs which contribute to an understanding of their territory and of its natural wealth through photography and observation. The primary goal of long-range research on the earth from outer space is to determine how information on our planet can be used in agriculture, geology, the water system, oceanic research and international environmental conservation. Interkosmos thus obtains a great deal of information on our planet which will serve as a good basis for the further development of the organization.

International collaboration on long-distance research on the earth (Primarily by manned space flights) takes place on a multilateral or a bilateral basis. Intergovernmental agreements on collaboration with the USSR have been signed by all the socialist countries. Non-member countries are also eligible for participation in the Interkosmos programs. Bilateral agreements on this form of collaboration have been concluded between the Soviet Union and France, India, Austria, Sweden and the United States. Interkosmos is thus making major contributions to the development of international collaboration for peaceful research on outer space.

Collaboration within the framework of Interkosmos takes many forms. Among these are launching of objects into space, such as the satellites Interkosmos, Vertikal, Meteor and others. Manned space flights with international crews, the development of apparatus for space research, observation of outer space from the earth, and other programs are also included. International research teams are studying the processes occuring in the earth's radiation belts and in the magnetosphere, and investigating the characteristic features of various types of radio waves and signals in the magnetosphere and the interaction of the atmosphere and the hydrosphere. Other programs include studies of solar x-rays, the solar wind, the gravitational field, the effect of weightlessness on the human body, the radiation risk of space flights, etc. The information obtained is used to advise geologists, agricultural workers, water system personnel, and environmentalists, those involved in conservation of material resources, and others.

The first Interkosmos satellite was set into orbit on 14 October, 1969. The first Czech satellite, Magion, designed for researching the spatial structure of low-frequency terrestrial magnetic fields, was set into orbit in 1978 as a part of the Interkosmos program. This satellite was launched on 24 October together with the Interkosmos geophysics satellite, and on 14 November, 1978, Magion separated from Interkosmos and began its own individual orbit. The first Czechoslovak satellite completed more than 16,000 orbits around our planet before it became inoperative in 1981.

The Interkosmos program is a multifaceted one. It also involves the construction of a unified telemetric system for the socialist countries, with participation by the Soviet Union, Czechoslovakia, Hungary, East Germany and Poland. Construction of the telemetric system, which is used to receive information from the Interkosmos satellites directly on the territory of the countries involved, was begun in 1968. Recently the new satellites Interkosmos 20 and 21 were set into orbit within the framework of the Interkosmos program, with the mission of doing research on the world oceans. These satellites have been testing out new methods in oceanology and in the automatic collection of data from terrestrial stations and those situated on the ocean's surface.

In the opinion of scientists working on the Interkosmos programs, one of the most promising directions of development of space research is the development of space technology. Specialists expect that as much as 400 new alloys will be developed in space, which will cause a revolution in industry. These are materials which can only be manufactured under conditions of weightlessness.

The primary goals of Interkosmos and its programs remains research on the earth, interplanetary space, and the planets. At the end of last year, for example, the Bajkonur spaceport launched the probe Vega (an abbreviation from the Russian words for Venus and Halley's comet), and a week later its twin. In March 1986, after 400 days of space flight, both probes are to intersect the orbit of Halley's comet and to perform necessary measurements over the next 5,000-10,000 kilometers. In the opinion of specialists, this program, which is a part of international preparations to welcome Halley's comet, should also give us a better understanding of processes occurring within our planet.

Czechoslovakia has also participated significantly in the Vega project. This is the tradition of our share in space projects. Our scientists have developed a special platform for the probe which, when Vega approaches its target, will eject and aim sensitive measuring apparatus at the comet. The equipment which will accomplish this is a special space robot, which serves as a good reminder of the Czechoslovak participation in the international CEMA organization Interkosmos.

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USES OF LASER TECHNOLOGY DESCRIBED

Prague RUDE PRAVO in Czech 3 Apr 85 p 4

[Article by S.W.: "Lasers for Industry and Interkosmos"]

[Text] One of the devices of modern technology, introduced into general practice in the past two decades, is the laser.

The early gas lasers have been succeeded by solid phase, semiconductor, liquid, and free-electron lasers. They are used primarily in the following--medicine, information systems, engineering equipment and machine tools, construction and demolition, scientific laboratories and in reading the bar codes used to label various industrial, food and other products.

All industrially advanced countries are showing an avid interest in laser research and development and in laser manufacture. In the Soviet Union, for example, two institute have been established for research on and development of power engineering lasers. Colleges are introducing curriculi aimed at training specialists in the use and application of laser technology in different areas.

In Czechoslovakia laser research and development date from 1961 (shortly after the development of lasers) at the Institute of Instrument Technology of the czechoslovak Academy of Science [CSAS], the Institute of Radioengineering and Electronics of the CSAS, the Tesla Vacuum Engineering enterprise, and different departments of colleges and universities. It may be stated that we were on time in starting research and development of this modern area of technology, and we can boast of a number of good results, but as yet there has been no widespread implementation of laser technology in industry, construction and elsewhere.

Nevertheless, we have some good examples of the application and use of lasers. The Kablo High-voltage Electrical Engineering Plant in Bratislava, in collaboration with Palacky University in Olomouc, has developed the L 60 laser measuring device, used by the enterprise itself for instantaneous control, and if need be, correction of the cables manufactured by them, especially in maintaining the proper thickness of insulation between cable and covering. Then there is the LIMS 1 comparator, with a laser interference system, used by the Kovosvit Engineering Machinery Plant in Sezimovo Usti to monitor the spacings of the lines of the coordinate systems engraved on iron machine tools. This device, also based on the LIMS 1 system, developed by Metro in Blansko, is used by Tesla in Karlin in testing linear inductance systems. The Czechoslovak Metrological Institute, in collaboration with the State Research Institue of Machine Building in Bechovice, has established an international standard of mechanical vibration for the CEMA countries. It is used to verify the primary standards of mechanical vibration, i.e., accelerometers, in free oscillation.

We would give further examples of the use of lasers in construction, geodesic engineering, mining and elsewhere. We will mention here only a device developed within the framework of the Interkosmos program for measuring the distance from earth or moon to geodetic satellite' of Geos type. The device is based on a ruby laser developed at the Department of Physical Engineering of the Czech Institute of Technology in Prague. A single pulse, lasting only one picosecond (10^{-12} sec) may radiate up to 300 MW of energy. These devices are used by ground-based station in the CSSR, USSR, Poland, India, Bolivia, Cuba, and other countries participating in the Interkosmos program.

9832
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GERMAN DEMOCRATIC REPUBLIC

TIGHTER LEGAL STRICTURES ON COMPUTER SOFTWARE TRADE URGED

East Berlin WIRTSCHAFTSRECHT in German Vol 16 No 1, Jan 1985 pp 13-15

[Article by Dr Elke Heera, scientific associate, GDR Academy of Sciences: "Once Again on the Legal Issues in Computer Software Exchange"]

> [Text] For the legal assimilation of software exchange which is urgently required, the criterion of scientific and technical risk, which is inherent in software, should be given stronger consideration
>
> Possible future legal forms of software exchange are the contract on allocation of software for paid use and a form of the delivery contract modified for intangible results

The views expressed by the authors Bernstein and Foerster (1) on the legal questions of exchange of machine-oriented computer software in the GDR are the reason for the following remarks.

In an exchange of computer software (hereinafter software), it is a question of an exchange of products which have been created by the strides of scientific and technical progress and which have gained great importance for their further acceptance in many areas. The mastery of complex innovative processes, which--as has been stressed time and again--hold a top position in business strategy, is inconceivable today without the comprehensive use of microelectronics (2). Through increased handling of administrative expenses by traditional electronic data processing systems, and also through the widespread use of microprocessors and small and process computer systems in control of machine tools, robots and equipment complexes, legal questions on software exchange have recently become increasingly topical.

That software exchange raises considerably more legal problems than hardware exchange is, as Bernstein and Foerster rightly note, evidently due to the particular character of software, which does not of course allow a schematic classification in the existing legally defined types of performance (3).

On the Character of Software

Bernstein and Foerster give an acceptable definition for software (4). As follows already from the comments on Basic Proceedings 22-A-1 and 3/83 (5), in software development, it is a question of the creation of a mathematical and logical combination structure, which is produced in mentally creative work by application of scientific work methods, is used to achieve scientific and technical progress, and corresponds to the nomenclature for work phases and performances in the plan for science and technology. Consequently, this is a scientific and technical performance in the sense of the definition of section 2, paragraph 1 of the 1st DVO/VG [Implementing Decree on Contract Law] which leads to a scientific and technical result. This result, however, has peculiarities which do not apply to other scientific and technical results.

Except some cases in which in addition to machine readable data media, documentation is transferred and switching performances are executed, software is a scientific and technical result which can, without additional performances, lead to further intangible results (e.g. information for earnings statements; voice works) or even directly to tangible products (e.g. manufacture of a workpiece or a mixing ratio for feed) by input of its physical media into the appropriate hardware. Software has, therefore, in part the particular character of being at the same time a scientific and technical result and a directly usable product. Using software (processing a program in a computer) already entails its copying which enables unlimited production and uncontrollable further distribution of program copies. Effortless and unrestricted copy capability is another feature of software. And finally, software is not accessible to commercial legal protection (6).

On Exchange of Software According to Current Legal Status

A measure of the importance of software for complex innovative processes in the economy is the present situation characterized by an unsatisfactory level of legal regulation concerning this. This is indicated by among other things in that indeed software has to be compiled according to the nomenclature for work phases and performances in the science and technology plan (E-phases), but the price is not set, as usual for scientific and technical performances, according to the principles of section 21 of the AO [Order] of 23 November 1983 on the Use of Economic Accounting in Research and Development (7). Price setting according to the price index file sheet 32/33 c/1976 resembles the price formation for industrial products. According to that, in addition to the developmental expenses and costs for manufacturing of machine readable data media, among other things, applications performances, maintenance and change service and an appreciable number of additional contracts are also to be considered in the price formation.

Since the 1st Implementing Decree on Contract Law already has a very high degree of abstraction in which it was not possible to regulate software exchange procedures and therefore can only provide a basic model (section 18 of the 1st DVO/VG [Implementing Decree on Contract Law], the AO [order] on the Use of Economic Accounting in Research and Development, issued later, likewise makes no concrete statements. Only software exchange in foreign economic relations which takes place as export or import of scientific and technical results through the contract types provided for that is clearly regulated (8).

Until the article published by Bernstein and Foerster, theoretical discussions only peripherally dealt with correlations between business law and software exchange problems encountered in EDV [electronic data processing = EDP] contract law (9). The hitherto underestimation of the practical importance of this type of problem consequently also caused inadequate theoretical assimilation of these issues. An alarm signal, so to speak, is being raised by the recently increased litigation. As follows from practical investigations in various economic units that produce software, there are varying views on contract formation mostly specific to a particular combine which have already been represented in comments on the published decision (10).

The basic decisions of the state contract court can indeed influence a uniform legal application according to current regulation (11), but are incapable of redressing the general lack of legal assimilation of this problem. Thus it is more imperative, as Bernstein and Foerster rightly note, to turn to such issues which promote creativity for software development, achieve economic accounting in relations between producers and users and ensure meeting the economic demand for software (12). Finally, juristic regulation has to be measured by how it supports real innovation strength in the economy and how it supports driving forces aimed at innovation and combats obstacles (13).

Considerations for Future Regulation of Exchange of Software

Considerations on the contractual formation of coöperation relations corresponding at best to the character of software can not avoid differentiating the software complex. The different combination structures (designated as among others system support, data processing projects, compilers, data base systems, assemblers, conversion routines, test routines, translation programs, and user software packages) are divided into applications or user (problem-oriented) and foundation and basic (machine-oriented) software (14). User software has a higher degree of individuality; basic software, a higher degree of universality of performance. The capability of a part of basic software, the so-called function and control units (FSE), to operate as mechanical control elements, apparently lead Bernstein and Foerster to the view that its exchange therefore has to be consummated through the delivery contract. In the process, they base their theory substantially on the nature of physical media of information and on its effect on the hardware (15). This view can not be readily followed. It is asserted that with any type of software, it is a question of intangible results which are supplied on different machine readable media. The external form of documented information should not be decisive for the use of a certain contract type. In my opinion, the criterion to be used is rather the scientific and technical risk inherent to this intangible result (16). Accordingly, consideration should be given to whether the rights-obligations structure of the contract, taking the scientific and technical risk into account, on selling the scientific and technical results for remuneration should be applied for the exchange relations in this connection. A criterion for this decision would be, for example, the possibility of the relatively complete debug capability of the software material. Accordingly, differences within the software complex can actually be determined.

Within the bounds of this article, only suggestions on the problem of the legal form to be applied for different software types can be made; a continuation of the discussion would be desirable.

The contract on the sale of software for remuneration should continue to be used in future when complete debugging is not possible, i.e. when a scientific and technical risk is inherent to the intangible result. This is, in my opinion , generally the case with user software; however, it may also apply to a portion of the universally applicable basic software. In the process, the principles on further sale to a third party, developed in Basic Proceedings 22-A-1 and 3/83, should be adhered to (17). Since software is not accessible to commercial legal protection, the international trend of incorporating other possibilities of protection against unauthorized use (without payment) and the amortization of high development cost should also be followed in future. The exclusion of further transfer, recognized as a special case, functions here as a type of surrogate for commercial protection law and as a financial incentive to develop software that can be used as universally as possible (18). The software must then naturally be available on a scale adequate for potential users.

The question of the legal form to be used for the exchange of fully debugged software is problematic. Since the delivery contract model (sections 67 ff. VG [Contract law]) applies solely to tangible products, the question of a possible orientation to a service performance contract (sections 69 ff. VG [Contract Law] is at least legitimate. The service performance contract does indeed also include intangible performance results; however, in its rights-obligations structure, it is aimed primarily at the implementation of an activity for the client with stress on the individuality of the performance process along with its typical result and is therefore not suited for software exchange (19). Considering the general principle of the solely responsible form of cooperation relations (section 6, paragraph 1, in conjunction with section 7, paragraph 2, VG [Contract Law]), for the exchange relations in question, a contract form based indeed on the delivery contract model of contract law, but varying in several procedures from it, should be investigated.
In my opinion, an extension of the traditional delivery contract model to the specifics of delivery of intangible results should be considered. For this purpose, a number of other questions still have to be clarified. Thus, e.g. the question of capital ownership would have to be posed from a new viewpoint since information in contrast to tangible products is amenable to multiple capital jurisdiction. In this capacity, it represents a part of social property and is at the same time a legal object. According to the traditional delivery contract concept, any purchaser of software could convey the capital ownership of this software to an unlimited number of prospects and still have it available for his own use. For reasons already explained, which are in conflict to unlimited and uncontrollable further distribution of the software, the possibility of a contractual arrangement of an ownership reservation passed on should be granted in a delivery contract on intangible results (20).

The questions of quality, reliability and warranty for intangible results also require further discussion.

Since the normative acts (Contract Law, AO [order] of 23 November 1983 on the Use of Economic Accounting in Research and Development), which are also authoritative for software exchange, are still relatively new and a revision is not expected in the near future, the ideas expressed should be taken as perspective suggestions for amendments. However, the collected regulation of this sphere of issues on ALB [general delivery and performance terms] should be investigated again already in the near future (21). This, in my opinion, need not be as extensive as the thorough attempt in the beginning of the seventies (22), especially since some of the problems then still open have in the meantime begun to be regulated legally (23); but others have assumed economic importance. The creation of ALB [general delivery and performance terms], which should contain both exchange and plan legal relations, would facilitate the orientation of the economic units which are being confronted with this problem on a growing scale.

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11. Ibid.

12. Cf Bernstein, K. and Foerster, K., loc. cit.

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14. Also Bernstein, K. and Foerster, K., loc. cit.

15. Cf ibid.

16. Cf the not expressis verbis standardized concept of scientific and technical risk in among others
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17. Cf Comments on Decree 22-A-1 and 3/83, loc. cit.

18. Since software development is pursued not exclusively by the hardware manufacturer and this principle naturally applies to all software developers, this interpretation also does not lead to a "monopolistic position" of a combine.

19. Otherwise this would be in computer hardware data processing performances, which are expressly included by the wording of section 69, Abs. [paragraph] 1, VG [Contract Law].

20. This construction inevitably reminds us of section 433 i.V.m. [in conjunction with] section 455 of the BGB [Civil Code]. Cf also comments: Palandt, O., "Kurzkommentar zum BGB [Brief Comments on the Civil Code]," 37th edition, Munich, 1978.
A direct adoption is, however, out of the question not only for reasons of legal policy, but also because in the case of software which is not legally protectable, there is no legal purchase in the literal sense.

21. The necessity of ALB [general delivery and performance terms] is also stressed by Suess and Treufeld.
Cf Suess, E. and Treufeld, C., "Contents and Fulfillment of Performance Contracts," WR [WIRTSCHAFTSRECHT], No 2, 1982, p 83.

22. Cf the draft of ALB [general delivery and performance terms] in RECHENTECHNIK UND DATENVERARBEITUNG, No 8, 1971, p 19, and discussion on that in this periodical (No 5, 1972, p 23; No 4, 1973, p 15; No 5, 1973, p 22).

23. Cf Section 69, paragraph 1, VG [Contract Law].

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MACHINE TOOL EXHIBIT AT 1985 LEIPZIG SPRING FAIR VIEWED

East Berlin NEUE ZEIT in German 15 Mar 85 p 3

[Article signed "B.M.": "More Rotor Blades for Electromotors--Representative Machine Tool Offering"]

[Text] The machine tool and tool branch of industry with its approximately 15,000 square meters of exhibit space is among the largest exhibitions in this year's Leipzig Spring Fair. In accordance with the central importance of the machine tool industry for any modern national economy all European CEMA countries numerous West European countries as well as Japan and the United States are present in Leipzig under the auspices of business enterprises, large concerns and specialized firms.

Most extensive is the exhibit of the GDR machine tool industry. Its offering is characterized by a high scientific and technical level. Within the specialized production spectrum of the four GDR combines the Berlin "7 October" Machine Tool Combine carries responsibility for lathes, grinding machines and gear-cutting machines. The Karl-Marx-Stadt "Fritz Heckert" Machine Tool Combine concentrates on processes for producing prismatic workpieces. The Erfurt "Herbert Warnke" Forming Technology Combine supplies integrated manufacturing systems and individual machines for sheet metal and massive block material forming. The Schmalkalden Tool Combine offers an extensive assortment of tools which make possible increased processing precision, an increase in cutting performance and a lengthened service life.

Design Is the Result of Agreement Within the CEMA Area

In Hall 20 on the fairgrounds we hear Gustav Steudel explaining "his" machine to interested visitors: the high-performance double-column automatic cutting machine PASZ 250.3—electronic. In the words of Steudel, "internationally the demand for electromotors is gigantic and growing. Just think of the demand in the household--from the refrigerator to the air conditioner nothing runs without an electromotor. Whether we're talking about cooling or heating we use electromotors in all processes. For this reason, especially in the manufacture of rotor and stator blades which are used in the electromotor industry, clients call upon us to build a machine which is faster than its predecessors which requires minimal times in maintenance and repair, which permits rapid tool change and fast error searches and which, not least of all, is environmentally friendly. That is to say, it must be capable of a vibrationless setup and have good sound insulation. The new automatic machine meets these requirements of the world market. Besides a 200-percent increase in labor productivity--the output amounts to 24,000 laminae per hour--the energy consumption has been reduced by 5.6 kw and noise emission by 20 db." Gustav Steudel, a salesman for the Zeulenroda Machine Tool Factory, a plant of the Erfurt "Herbert Warnke" Forming Technology Combine, looks really small standing next to the machine which together with its surrounding noise shielding cabin attains the stately height of almost 6 meters. "This automatic cutting machine," Steudel resumes, "was developed in the GDR--USSR--CSSR joint design office."

Of course, one should not imagine that in this joint office two German, two Soviet and two Czech designers are standing at the same drafting board. Rather it is a matter of fitting together the technical parameters so that any replacement part will fit into any machine regardless of where it was constructed. With this in view the designers and technologists of our three countries meet two or three times a year.

With Dipl Eng Gerhard Meyer of the Research Center for Forming and Plastic Processing Technology we go to another exhibit by the Erfurt Forming Technology Combine. The PAUD 40/4 automatic forming machine displays to a group of experts its breathtaking speed in the manufacture of covers for preserve jars. It produces 54,000 pieces per hour. A complete manufacturing line is presented ranging from the extraction and supply of the aluminum ribbon through the form-stamping of the grooved covers to the subsequent rolling of the edge of the cover.

Within the framework of CEMA specialization this product group of the packaging industry has been assigned to the Aue Sheet Metal Processing Machine Plant and Tool Plant. On the plus side of the highly productive automatic machine there are a reduction in material consumption by 7 percent, an energy consumption reduction by 12 kw and a doubling of labor productivity.

While the PAUD produces jar tops for Eberswald sausages or preserved fish, the machine also performs quite different tasks. This is characteristic of the extensive servicing and performance program of the Erfurt combine. Dipl Eng Wolfram Altmann shows us the electronic profile rolling machine UPWSZ 63.0 for which he was the responsible development engineer. This profile rolling machine has been developed to produce the round thread on bucket chain bolts in surface excavation machinery. It is coupled to a ZIM 60-1 industrial robot from Wittstock which has had its carrying capacity expanded from 50 to 90 kg in order to handle the heavy workpieces which each weigh 61 kg. Wolfram Altmann demonstrates its mode of operation for us: "The robot extracts the preturned bolt from a pallet and lays it on the vertically adjustable workpiece carrier. The latter is transported into the work space of the profile rolling machine. Then from opposite directions the tools penetrate the workpiece and cut the round thread in only 20 seconds. Finally, the workpiece carrier reemerges and the robot caliper extracts the final machined form and lays it in the bolt magazine."

For Effective Mining of Our Brown Coal

With this highly productive profile rolling machine the machine tool building industry makes available to the brown coal mining industry an important instrument for effectively mining our most important energy source. Because with the introduction of the screw bucket chain linkage in surface mining equipment we may expect an annual material cost reduction of several million marks. The bucket chain bolts play a quite decisive role in these savings and these bolts are produced in an automated manufacturing process of which the profile rolling machine is the central feature. Because the thread rolling process has convincing advantages: for one thing, rolled profiles can support higher stresses than those which have been cut and secondly this process yields lower costs as a result of short manufacturing times and a high level of material utilization.

We have selected three examples from Hall 20. They serve to represent solutions to thousands of technological problems, manufacturing lines and linkable individual machines which the machine tool industry of the GDR with its 80,000 employees offers to its customers at home and abroad.

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GERMAN DEMOCRATIC REPUBLIC

MICROELECTRONICS EQUIPMENT AT 1985 LEIPZIG SPRING FAIR LISTED

East Berlin NEUES DEUTSCHLAND in German 11 Mar 85 p 3

[Article: "High-Performance Microelectronics--Developed and Manufactured in the GDR: Recognition for Outstanding Engineering Solutions in the Area of Automation Technology; Conversations at Fair Exhibits on the Expansion of Favorable International Relations"]

[Excerpt] Today in all leading industrial countries microelectronics is having a permanent effect upon the entire technical and economical development scene. From microelectronics there issue powerful impulses toward the updating of products and technologies in all industrial areas. It has a decisive effect in lowering the productive consumption of labor, while nevertheless enhancing generally the quality and reliability of production. And it has resulted in the formation of an entirely new type of technique--a system of automated production devices. All of this is impressively reflected in Hall 15 where the producers of structural elements and important users of these elements in GDR industry are located and bear witness to the modernity of our national economy. The GDR is among the few countries which develop their own microelectronic structural elements and produce them.

Here in Hall 15 Erich Honecker, Willi Stoph, Horst Sindermann and other members of the party and state leadership began their circuit of the fair. In the name of the 490,000 workers employed in the electrotechnology area and in electronics they were heartily welcomed by Minister Felix Meier. Referring to the resolutions issued in 1977 with the aim of accelerating development production and use of microelectronics he asserted that this youngest branch of industry has since then developed with extreme dynamism and reflects in a special way a farseeing policy devoted to the welfare of the people. In the name of the workers in this area he expressed thanks for support given to the development of microelectronics in the GDR. Today the accomplishment of economic strategy and progress in overall intensification is more and more being carried by microelectronics. This following example illustrates the economic effects which it creates: The U 881 microprocessor weighs 5.6 grams and takes 75 minutes to manufacture. It replaces traditional structural elements--transistors, diodes, resistors, printed circuit boards--having a mass of 306 kg and taking 400,000 minutes to manufacture. Seen in this light a special national economic dimension accrues to the commitment of the Erfurt Microelectronics Combine and of all other combines operating in this area, in the year before the 11th Party Congress of the SED, to exceed the planned net production by 3 days of output.

New Structural Elements and Technologies

In the users' microelectronics center the general director of the Erfurt Combine, Prof Dr Heinz Wedler, explained how the producers of structural elements, whose products are exported to almost 100 countries, have prepared for the fair. As many as 104 new developments, products of the highest quality and reliability, expand the varieties of modern microelectronic structural elements available in the GDR this year to a total of 1,360 basic types. In 1985 through further intensification, through new technologies and with a substantially improved exploitation of facilities the combine will increase the production of single-pole switching circuits to 173 percent.

The combine is demonstrating a big step toward more effective use of microelectronics by developing new technologies for switching circuits specifically designed for the customer. These make possible the manufacture of tailored structural elements for the most varied application. On a foundation of standardized basic elements the user can himself develop desired switching circuits and for such purposes there is available to smaller enterprises the electronics applications center of the combine with branch plants in all districts.

Communications Technique Having Many Advantages

The possible uses of microelectronics are impressive: In addition to substantially shortened development time and the reduction of associated costs by on the average 50 percent there is an increase in the reliability of components by 20 to 70 percent. Taking as an example a printed circuit board of the K 1520 microcomputer and of the prototype of a switching circuit specifically designed for the customer the general director demonstrated the advantages of the new technology: the function of a 400-cm^2 printed circuit board having 140 active and passive structural elements including 33 integrated circuits will now be taken over in the future by a single switching circuit.

The products of the Dresden Robotron Combine underscore the reasons why there has once again only recently been such emphatic support, based upon suitable legislation, for the accelerated production and use of microelectronics. As a principal user of structural elements this branch of industry together with its products has become one of the most important sources of increased efficiency in our national economy. General director Friedrich Wokurka introduced a new workplace computer A 7100 and the 1715 personal computer aimed at increased efficiency in planning, scheduling and accounting operations as well as in scientific-technical computations and in the preparation of production. Here, too, the use of such equipment speaks clearly for progress in the use of microelectronics: threefold increases in production, eightfold memory capacity and an energy consumption reduced by 20 percent are characteristic features of the workplace computer.

It owes its advantages primarily to the use of a new 16-bit microcomputer system developed jointly with the microelectronics combine. This is also the heart of the designing workplace for printed circuit board manufacture, likewise offered by Robotron. The computer-supported preparation of production in turn has the effect of conferring greater tempo and efficiency upon the use of microelectronics.

Examples of the way in which producers combine their own efforts toward modernization of production with advanced in-house work toward the development of specific switching circuits are offered by the Leipzig Communications Electronics Combine, which was the first exhibit visited by Erich Honecker. General director Hans-Eberhard Herzog explained that traditional communications technique is being increasingly replaced today by digital technology. The latter permits an efficient transmission of speech data and pictures. The combine has made its contribution to this by developing a fully electronic telephone exchange which can link from 16 to 64 participants. The space-saving NZ 400 D is a man-of-all-work in the best sense of the word: connections are established automatically, charges recorded, the call is autonomously transferred, conference calls are set up, the system "buzzes" a participant whose line is occupied, makes repeat calls automatically--that is only a small excerpt out of the gamut of its capabilities.

Finally, it was also a microcomputer system which made possible the development of the new F 2000 transmitting and receiving teletype. It relieves the operator of routine work and offers a high degree of functional comfort. New also is the present text storage which holds approximately the characters of four A4 pages and is arbitrarily correctable. Transmission takes place in response to a call from the partner. Foreign customers will especially appreciate the fact that the printing head is capable of producing closed script in every language and can write both from right to left and from left to right.

Robotron and Zeiss: CAD/CAM Systems

Just how decisively microelectronics has affected the development of automated equipment becomes especially apparent when one considers the products of the Berlin Automation Facilities Combine. Here general director Heinz Brandt introduced new generations of control systems to the guests. Years of research and production experience have evidently gone into the electronic 700 system. The latter, with the CNC 700 numerical control for machine tools or with the IRS 700 industrial robot control is especially impressive in demonstrating its capabilities. The latter is able to simultaneously control up to 16 robots in all motion sequences. The modular construction of the controls produced by this combine possesses the advantage of being adaptable with great flexibility to varied applications.

The modern level of development of economic strategy also imposes special demands for another reason upon electrotechnical and electronics combines. In all branches of industry modernization processes are taking place with increasing speed in terms of products and technologies. Therefore there is ever greater urgency in the need to employ computer-supported systems of devices to rationalize the preliminaries of production and the manufacturing itself. These so-called CAD/CAM systems are becoming an elementary prerequisite of modern and economically efficient production. To this end Robotron has provided a workplace for designers and technologists which bears the designation A 6454. It has received much attention from the members of the party and state leadership. General director Friedrich Wokurka and general Director Dr Wolfgang Biermann of the Jena Carl Zeiss Combine (the latter providing drawing devices for this system) referred to programs which have already achieved extensive rationalization in the construction of machine tools, in the automobile industry, in electrotechnology and electronics, in plant construction and also in the textile industry and the shoe industry. It has been possible to reduce development times and development costs by as much as 80 percent and 50 percent, respectively, as compared with traditional methods. It has been possible to save as much as 90 percent of the working time of the technologists. This is a further proof of the role played by microelectronics as a catalyst for scientific-technical progress in the national economy.

The comrades of the party and state leadership concluded their tour with an informative talk on the status of the Berlin "Friedrich Ebert" EAW Combine. Using a model Minister Felix Meier explained the regulation and control of complex industrial processes. Among other innovations there is the use of fiber-optics cable which guarantees greater stability in the equipment. Erich Honecker expressed thanks and acknowledgement on the part of the party and state leadership for the scientific-technical accomplishments exhibited in the microelectronics user center. He expressed the wish that workers in this area would achieve new successes in their efforts to develop microelectronics in the GDR even more rapidly and to organize the applications of electronics even more comprehensively in preparation for the 11th party congress.

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GERMAN DEMOCRATIC REPUBLIC

USE OF MICROELECTRONICS IN INDUSTRY ASSESSED

East Berlin NEUES DEUTSCHLAND in German 25 Mar 85 p 2

[Article signed "O.L.": "Our Economic Strategy and Microelectronics--A Catalyst of Progress"]

[Text] On Thursday in our journal the general directors produced reports in which they described how the collectives of their combines have tackled their competitive commitments on the occasion of the 40th anniversary of the Liberation and in preparation for the 11th Party Congress of the SED. These reports made it clear that in all projects aimed at increased production and increased efficiency--whether in the Schwedt Petrochemical Combine, in the Riesa Tubing Combine, in the Lacquer and Dyeing Combine in Berlin or in the Magdeburg Unitras Combine--microelectronics is playing a role. It is establishing a basis for new technologies, for more effective configuration of phases in the production process, new systems of measurement control and regulation and at the same time is providing a basis for new products. In brief, the use of microelectronics confers in manifold ways a broad and profound effectiveness upon the process of production intensification.

Microelectronics is one of the most recent branches of industry in the GDR. Since 1977 it has developed with the greatest dynamism and--supported by suitable resolutions on the part of the party and of the council of ministers--it has commenced the highest rate of growth to be seen in any branch of industry. At the 9th Congress of the Central Committee of the SED Erich Honecker has once again underscored the key function to be performed by microelectronics within the framework of the party's economic strategy for the eighties. He declared that "in carrying out the next steps of our economy in the direction of high technology and in other advanced directions microelectronics is a decisive link in the chain. From it there must arise on the national economic scale powerful impulses toward increased labor productivity."

Therefore both the production of structural elements in microelectronics and also the direct application of microelectronics merit equal attention. With regard to production the GDR has reached a level which makes it possible to compete in 90 to 95 percent of all internationally known areas of application. There are available new structural elements and new technologies which largely meet the special requirements of users. In 1985 the production of single-pole switching circuits has increased by as much as 73 percent.

Nevertheless, the producers are now faced by the need to further enhance both tempo and quality.

With regard to possible applications and with regard to the utility which can be achieved in individual cases there already exist today an abundance of examples in the GDR. The electronic teletype F 2000 exhibited recently at the Leipzig Fair is such that in its production as compared with its predecessor it makes possible about 45 percent savings in rolled steel, 72 percent in copper semifinished products as well as 60 percent brass and 58 percent aluminum. The new sheet-fed offset printing machine of the Varimat series possesses a microelectronic control which guarantees the user more than 50 percent increase in productivity. Robotron is exhibiting a system of devices for automated development, design, planning, manufacturing-planning and manufacturing control. Anyone who wants to keep in step with the times will in the future find such systems indispensable. The same is true of the future-oriented area of flexibly automated production shops. In the Prisma exhibit of the Leipzig Spring Fair it was apparent that GDR industry is creating solid intellectual and material foundations for the production of NC machines, robots, process computer technology as well as devices for measurement testing and assembly and it is clear that GDR industry is taking important steps into new domains. At the same time the tempo of developments which is evident in these areas internationally continues to be a distinct challenge to enhance still further the activities of potential users. Whereas formerly steel consumption per capita was taken to be a measure of the industrial level of a country, today one must replace steel consumption with the "consumption" of microelectronics--so great has the economic significance of the latter already become.

This brings us once more to those combine commitments which were mentioned at the outset. From these it is easy to infer that the dynamic growth in efficiency called for at the 11th party congress under competitive conditions demands everywhere an active familiarity with microelectronics in the broadest sense of the word. Microelectronics is at one and the same time a catalyst of scientific-technical activity and thus also an important source of social progress. Borrowing from a current expression, one might formulate the matter this way: Tell me where you stand in microelectronics and I will tell you how far forward you have come in the realization of our economic strategy.

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ELECTRON PHYSICS INSTITUTE'S MICROELECTRONICS RESEARCH VIEWED

East Berlin NATIONAL ZEITUNG in German 23-24 Feb 85 p 3 of supplement

[Article by Irene Gotthardt: "Scientific Institutes of the GDR (II): Number One Topic: Semiconductors--The Broad Spectrum of the Central Institute for Electron Physics"]

[Excerpt] A large modern building on the Hausvogteiplatz in Berlin is an attention-getter--it houses the Central Institute for Electron Physics (ZIE) of the Academy of Sciences of the GDR.

In the year of the founding of the GDR there existed in the academy, which was reopened in 1946, seven larger physical research facilities. Five of them turned out to be the "primary cells" of today's Central Institute which was founded in 1969.

Under its director, Prof Karl Friedrich Alexander, the ZIE carries heavy responsibility for guaranteeing the scientific front position of the national economy of our republic.

Fundamental research concentrates on two principal areas: plasma physics and semiconductor physics. The research topics aim at creating a long-term front position for microelectronics. In addition, the aim is to make fundamental contributions in selected areas to controlled thermonuclear fusion and to the development of special types of laser. Therefore in the past decade the state enterprises of the Microelectronics Combine, the NARVA Combine and others have become cooperative partners of the Central Institute for Electron Physics.

For example, the scientists and colleagues of the Central Institute have helped the Erfurt Microelectronics Combine to precisely define and delimit the technological development for our country's microelectronics program. The task was taken in hand of building a technical organization which with its facilities and its technological capabilities corresponds to the advanced international state of knowledge. The research activities have been so arranged that upon presentation of the prototypes laboratory production is possible and thus entrance into full production has been accelerated.

As emphasized by area chief, Prof Dr Hadamovsky, hitherto, for example, all semiconductor structural elements in the GDR for power electronics have been produced in bipolar form. But internationally there is a trend toward the use of unipolar diodes. This is a consequence of the increasing use of microelectronics and the associated application of so-called combinatorial circuit components in the instrument manufacturing industry. (Combinatorial circuit components serve for power supply, for example, in EDP devices, robots, communications units and medical apparatus which are equipped with integrated circuits, preferably in the form of microprocessors.)

To the Central Institute the task was assigned of developing together with the Stahnsdorf "Karl Liebknecht" Microelectronics Plant a new procedure for manufacturing chips. At the same time the institute, with the participation of its industrial partner, was to create the basic types of a new family of structural elements for the platinum barrier type of diode which at the present time represents the world standard.

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HUNGARY

BIOTECHNOLOGISTS RECEIVE HIGH STATE PRIZE

Budapest MAGYAR HIRLAP in Hungarian 4 Apr 85 p 11

[Interview with Lajos Alfoldi, Lajos Ferenczy and Pal Venetianer by Istvan Palugyai: "The Train Has Not Departed Yet"]

[Text] For their achievements in the field of microbiology and genetics, for the creation of a school of scientific research and for their role in scientific organization, a divided State Prize was awarded to Lajos Alfoldi, corresponding member of the Academy, chief director of the Biology Center at Szeged (SZBK) of the MAT [Hungarian Academy of Sciences]; to Lajos Ferenczy, doctor of biological sciences, professor and department head of the microbiological department of JATE [Attila Jozsef University]; and to Pal Venetianer, doctor of biological sciences and director of the Biological Institute of the SZBK.

Behind the text explaining the prizes there is one word: biotechnology, or in a more restricted sense, genetic engineering. Indeed, all honor is due the three scientists because they had a lion's share in initiating research in modern gene technology in Hungary in time, even by international standards, and they have laid the foundations of a biotechnology industry which can point to significant successes.

[Question] FromLajos Alfoldi, the chief director of the citadel of modern biology, I first want to know what is meant by "biotechnology" now, in the spring of 1985.

[Answer] According to the traditional definition, it is the theory and practice of manufacturing processes that are conducted with the aid of life processes and with living systems. I would like to add a qualification. I would rather talk about the new biotechnology which includes gene manipulation, plant cell and tissue culture, cell fusion and the transfer of embryos.

[Question] Many think that in microelectronics we have been definitely left behind in international competition, that the "train has departed." In biotechnology, since its massive industrial application is still only a great promise even in the developed capitalist countries, maybe we still can be passengers. In any event, have we reached the station in time, that is, has the laying of the foundations occurred in time?

[Answer] This is indeed so, in theory the train is still at the station. But instead of being on the platform, we are still in the waiting room, interrupts professor Ferenczy.

We have made some steps forward with the help of the national plans supported by the Academy and the OMFB [National Technical State Development Committee] in the last few years, corrects Lajos Alfoldi.

We have no choice, we have to do research, because even if we can't compete any more we can adopt the results from abroad at the right moment for our applications.

The name of Lajos Ferenczy is familiar everywhere where biotechnology is practiced because of his pioneering invention and development of a method for the transfer of traits between higher microorganisms, the method of the fusion of cells without walls (protoplasts).

[Question] What kind of chance does a Hungarian researcher working here today have for achieving an international reputation?

[Answer] I could say that not much, but that would not be completely true. It is a fact that it is more difficult for us to appear with significant innovations than for our colleagues working under much better conditions abroad. Yet, a thorough knowledge of the pertinent literature of the field can help, and if we have obtained an advantage at the start in some way, we can preserve it with more innovative ideas.

And now Pal Venetianer, the leading Hungarian authority on gene manipulation, an internationally recognized research worker in the field of gene-mapping and cloning.

[Question] What new surprises are being prepared in the "witches kitchen" under your direction, where among others the cloning of the gene of the precursor of human insulin, proinsulin, was accomplished with an original method?

[Answer] Besides improving the bacterial strain responsible for the production of insulin, we have started the manipulation of enzyme structures via genes, called "enzyme engineering." So far we have determined the complete gene structures responsible for three enzymes. Now, having intentionally altered the genes--having forced them to mutate--we have implanted them into bacteria and we are examining how this affects the special interaction between the hereditary material and the proteins, the deciding factor in all biological processes.

[Question] What do you see as the greatest obstacle to putting into practice the results of the biologists?

[Answer] The slow pace which is also characteristic of theoretical research. There are few people among us who work as if a pack of wolves were chasing them. Yet, in the biotechnology race, this is the situation. Once you have the proper attitude, you still have trouble getting the necessities needed for research. The situation is the same with decision making, while as concerns industry, the lack of a sufficient profit motive is the retarding factor.

[Question] Finally a question to all three of you: What do you consider to have been the most important part of your own work?

[Answer] Lajos Alfoldi: The pioneering development of fusion techniques between bacteria, and the founding, and my management during the last 15 years of the Genetics Institute of the SZBK.

Lajos Ferenczy: The realization of the protoplast fusion; the about 40 specialists who have come from my laboratory; and the fact that the work of the members of a department that started from ground zero has reached international recognition during the last decade.

Pal Venetianer: That I was able to assemble a good team with which we have been able to adopt rapidly and successfully one of the most important scientific methods of our time, and that we have managed to add some contributions to our own.

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HUNGARY

PERSONNEL OF NUCLEAR POWER PLANT WIN PRIZE

Budapest MAGYAR HIRLAP in Hungarian 4 Apr 85 p 11

[Article by Zador: "The 'Seven-In-Hand' of Paks"]

[Text] The nuclear power station of Paks currently operating with two blocks of 440 megawatts each has, from several points of view, a distinguished place in the economic life of our country and in the history of its technical development. During the hard winter just behind us it was of great significance that the first block (operating since 1982) and the second block (in use since the fall of 1984) were producing 3.7 billion kilowatthours of electric energy instead of the planned 2.7 billion, which is about a tenth of total consumption. The plan for 1985 foresees 5.5 billion kilowatt hours, more than 15 percent of the projected consumption, and, hopefully, Paks will exceed this goal.

It must be added that all this was achieved with the high-level management of a technology that did not have any precedents in Hungary. The power station of Paks is the first installation in our country to apply a leading-edge technology of the second half of the 20th century, that of nuclear power engineering. During construction and startup there were scores of problems, partly because of the novel nature of the technology, partly because of the modifications made in the plans and in the deadlines for the delivery of equipment. It is obvious that realization of this project and the surmounting of the attendant difficulties has required extraordinary efforts from the persons who are being honored now, and from the hundreds and thousands of people who stand behind them.

Right now the third block is being built at Paks. The complete power station consisting of four 440 megawatt blocks should be ready by 1987, according to the plan. There are also plans for putting in additional blocks before the turn of the century. According to calculations and measurements the Danube can provide cooling water to the power station up to an output of 6000 megawatts, taking into consideration the impact on the environment. By the way, it is mainly the nuclear power capacity to be installed that will be called upon to satisfy the yearly increase of 300 megawatts that will occur to the end of this century.

It is evident that it is very difficult to select and isolate the contributions of a few people from among the planners and managers of such a large enterprise; nevertheless, in what follows we will attempt to sketch in broad outline the contributions of the seven experts who have received the State Prize.

Istvan Feher, a radiation physicist and chief division head of the MTA Central Physics Research Institute, had an outstanding role in the creation of an environmentally safe system that is exemplary even by international comparison.

Jozsef Kordis, the now retired director of Eroterv, was the director of planning in Hungary since 1966, since the conception of the idea of the power station. He played an outstanding role in working out the agreement of plans.

Tibor Laczai Szabo, chief adviser of the Ministry of Industry, was involved with the power station since 1966. Since 1978, the creation of the State Startup, Control and Acceptance Committee, as the committee's secretary, he assumed the difficult and responsible job of coordinating the startup permits. By the way, the outstanding safety of the power station is partly due to the unyielding rigor of the experts and the various forums participating in the acceptance process, and the practice of totally neglecting any plans for acceptance by certain pre-set dates.

Jozsef Polya, the director in chief of the Nuclear Power Corporation of Paks whose chief engineer he was previously, has assembled a young and productive group which has superbly completed its tasks under his direction. He had also developed a very good relationship with the experts working at other power stations of a similar type.

The life of Benjamin Szabo, the chief director of the National Long-Distance Power Transmission Corporation, is closely linked with Paks. Since 1966 in different positions he was the dynamo of construction, first as a liason of the ministry, then as a director, then in 1978-82 as the government liason. It was his responsibility to coordinate and facilitate the work of the huge company that reached the size of ten thousand workers at its peak. This effort demanded great mental and physical capacities.

Geza Szabolcsi, the deputy technical director of the Power Station Investment Company who was party to the construction of virtually every power station built so far, has successfully handled an investment that has exceeded in magnitude all others to date.

Lajos Voross, the chief division director of the Research Institute for Industrial Electrical Power, had an outstanding role in the establishment of atomic power research at the Institute. With his young, talented and well-trained corworkers he has achieved very good results in safety analysis and the examination of vacuum spaces, among other fields.

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ROMAINIA

RESEARCH ON PRODUCTS OBTAINED BY POWDER METALLURGY

Bucharest METALURGIA in Romanian Dec 84 pp 625-628

[Article by Professor H. Colan, Cluj-Napoca Polytechnical Institute]

[Text] Research in the field of powder metallurgy carried out at the Cluj-Napoca Polytechnical Institute by the Chair of Metal Technology and, since 1968, at the Research Center for Powder Metallurgy represents over 3 decades of activity. This research has furthered the development of the science and technology of powder metallurgy in this country and has led to some remarkable industrial accomplishments. These include the development of technologies for the production of metal powders and of high performance sintered products which have replaced imports, have made good use of raw materials and energy. It is notable that the research for the development of metal powders and sintered products has included the technological development up to the industrial design of specific equipment and of production lines; this has led to industrialization of powder metallurgy in Romania and to the construction of several plants. The technologies and installations are mostly original, based on local design; they make use of a large number of inventions and help reduce import of licensed technologies.

We will present here some of the most significant accomplishments of the last years, those of economic importance.

Technologies for the Development of Metal Powders

Iron Powders. The production of iron powders by direct reduction of iron oxides by means of carbon and a current of methane is the result of studies which have led to the metal powders plant at Cimipia Turzii Metallurgical Combinate (1969). Presently, this plant continues to produce some varieties of FREM [expansion unknown] (standardized) powders for coating welding electrodes and for other purposes, as well as for sintered parts. The latter are of high purity (less than 0.02-0.03 percent C, less than 0.3 percent O) due to a thermochemical treatment in dissociated ammonia (FREM S 160-124 and FREM S 400-28) [expansion unknown]. The original process is based on three technological patents and five equipment patents (rotary hearth furnace "carousel," rolling hearth furnace, etc.).

Aluminum Powders. The research carried out by this Chair (including three patented inventions) has been applied at IMMN [Institute for the Metalurgy of Non-ferrous Metals] Zlatna in an industrial plant for the production of aluminum powders. The process consists of atomizing from liquid phase by means of multiple fuel oil jets and then milling in vibrating ball mills. The plant produces powders for autoclave-treated cellular concrete, for pyrotechnics, for ferrous metallurgy (two varieties: a deoxidizer and protective paint for metal structures).

Present efforts aim to diversity the products (pigments for the paint industry) and to make use of aluminum foil scrap from the Slatina Factory for Aluminum Laminates.

The production of aluminum powders has achieved significant savings by replacing imports. The first stage consisted of industrial production of the powders. Later it was possible to develop sintered parts for the machine building industry, among them parts made of type S.A.P. [expansion unknown] materials (Aluminum with 7-15 percent Al_2O_3) for compressor and motor pistons, turbine rotors, blades, sheaths for the fuel of nuclear power plants, etc. The remarkable thing about these materials is their high recrystallization temperature and resistance to elevated temperatures due to the fine dispersion of the aluminum oxide.

Metal Powders Obtained from Superior Utilization of Recyclable Materials.

During the past few years, the Metal Technology Chair at the Cluj-Napoca Polytechnical Institute has been steadily working on research concerning production of powders using recoverable materials:

--Tungsten and Cobalt from hard alloys (machining tools, drill bits, dies, etc)

--Copper from machinery difficult to disassemble, such as rotors and stators of electric motors, radiators, electrotechnical parts; and also from scrap which cannot be recovered by pyrometallurgical means (mill scale, etc.)

--High purity iron from the scrap of dye factories;

--Copper, Nickel, Tin, Tungsten from the manufacture of diamond drilling tools. Three patented inventions resulted.

Copper Powder. The recovery processes developed are original and consist of selective chemical treatment and thermal reduction. The first process uses inexpensive, auxiliary materials, made in Romania with low energy consumption. The equipment was locally designed and built.

Tungsten Powder. The amount produced is low because of lack of raw material. As the collection will improve, it is expected that production will expand. Client factories are "Electroputere" at Craiova (for W-Cu, W-Ag contacts), "Diarom", "Neferal" and "Sinterom." Considerable savings of tungsten carbide are expected.

Colbalt Powder. Studies have been undertaken for the reduction of cobalt oxides.

Research for the utilization of recyclable materials reduces imports. Presently, research continues to establish an industrial model for the technological process of recovery; various technical solutions are being tested in order to perfect the process and attain design capacity. The utilization of scrap containing Titanium, Tantalum, and Niobium is being contemplated.

Binders and Mixtures of Metal Powders for the Development of Matrices For Diamond Drilling Tools.

Research has so far solved the following problems: development of metal powder mixtures for the matrices of diamond drilling tools, development of granular binders for infiltration of these matrices.

The results have been lower expenditure of hard currency and the avoidance of drilling losses which occur when these tools are not used. It has also opened the possibility of exporting these tools.

Research has helped establish the technological process and design of installations for the development of these products.

The tools manufactured from materials thus developed have been tested in parallel with tools manufactured on the basis of licensed technologies. Their performance has been comparable and sometimes even superior. Research and design carried out by this Chair has helped build the unit for the development of binders and mixtures. In the past 2 years, a range of binders were developed in order to use the Romanian synthetic diamond (Dacia) in the manufacture of drilling tools; this should bring about additional savings of hard currency.

Alloys and Powders for Metallization. These are used to produce hard coatings which are resistant to wear, corrosion, and high temperatures. The processes used include metallization in oxy-acetylene flame or in plasma, hot or cold, using metal, ceramic, or metal-ceramic powders. The process has applications in all industrial fields (machine building, metallurgy, transportation, chemical, etc.) for the production of new parts and assemblies and also for repairs (reconditioning of worn parts). Several companies have practically a monopoly on the supply of powders throughout the world. (METCO-USA; CASTOLIN-Switzerland).

Various alloyed powders are being used, based on Ni, Co, Fe, metal-ceramic powders (cermets of metal-oxide, metal-carbide) and ceramic powders (Al_2O_3, etc.). The powdered alloys are metallurgically bound to the base metal using the technique of simultaneous spraying and fusion.

Research started with the study of the phases and structural components of these eutectic alloys, for two categories: Ni-Cr-Si-B, Co-Cr-W-C for metallization by means of gas flame or plasma. Research also considered the Ni-Al alloy for an intermediate layer.

The technology for production of these powders was developed on an atomizing installation using pressured gas, under protection of Argon. The installation was designed and built at the Institute.

Technologies for the Development of Some Sintered Products.

Sintered Materials for Electro-Erosion Electrodes.

Research for the development of these materials has considered the widespread use of electric erosion processing in all large and medium-size machine shops in Romania, as well as the development of domestic production of electro-erosion machinery.

The main characteristics of these materials--isotropic properties and high performance--resulted from the process of isostatic compacting which was included in the development. The adequate devices designed and built have made it possible to develop technologies for isotropic sintered copper, copper-graphite, and tungsten-copper in a wide variety of bars with round or square crossection, and pipes. Semi-finished products are made of W-Cu(75/25), isostatically compacted and infiltrated with copper. The technology, officially sanctioned in 1979, promises significant savings of hard currency. It is noteworthy that the studies used tungsten powder from scrap light bulb filaments recovered by the "Sinterom" plant, according to one of its own processes.

Superaluminous Ceramic Products Obtained by Isostatic Compacting. Among these materials and products we will mention the following:

--Superaluminous ceramic rings for frontal (sic) seals. In addition to the manufacturing technology (isostatic compacting, sintering), the process of machining the parts during heating has been optimized. A medium-size device for the isostatic compacting of semi-finished products was developed and built; technical assistance was provided for the design of an industrial unit producing ceramic rings;

--Balls for ball mills: these will replace 500-600 tons/year of balls imported from the West;

--Balls for the purification of molten aluminum;

--Insulating parts for diodes and high-power rectifiers;

--Ceramic dies for atomization;

--Ceramic parts for tubular fuses

Overall, the application of research has led to savings of 80-90 million Lei/ year (production, replaced imports).

Other accomplishments in this field include manufacture of semi-finished products made of superaluminous ceramic by means of isostatic compacting--for use in electrical insulators--and the design of equipment for isostatic compating.

Electrical Ag-CdO Contacts and Wire for Ag-Ni and Ag-CdO Contacts.

The manufacturing technology developed for Ag-CdO contacts is used at the Bucharest "Electroaparataj" factory. Valuable progress was made in understanding the phenomenon of dispersion in these sintered pseudo-alloys, based on the inclusion of fine particles of oxides in the mass of another metal, without dissolution or chemical reaction. The experience gained was used to build a new section for electric contacts at "Sinterom."

The wire for Ag-Ni contacts is presently manufactured according to a technology developed during the past 2 years at "Sinterom" and "Electroaparataj"-Bucharest. This technology consists of the compacting and sintering of a semi-finished product (bar), extrusion and/or rotary forging, drawing, cutting, mounting, shaping.

Sintered Friction Materials.

Research has helped develop the technology for the manufacture of friction disks for clutches and brakes and of friction blades for electromagnetic couplings. The process consists of the application of these materials on copper, iron, or steel supports in thin or very thin layers (0.25-0.30 mm) by a newly established method (sprinkling); this has replaced the licensed technology and the import of products from the West.

The design and construction of the specific equipment and the completion of an industrial unit at the Cluj-Napoca "Sinterom" plant have made it possible to deliver, currently, tens of types and sizes to the machine building industry.

Presently, research work is underway to develop friction materials for very severe mechanical and thermal tasks; these materials are based on cermets Al_2O_3-W, Al_2O_3-Mo, ZrO_2-W, ZrO_2-Mo, MgO-W, MgO-Mo, etc. These have maximum hardness, refractary properties and wear resistance.

Stainless Metal Filters.

The manufacturing technology developed at the Cluj-Napoca Polytechnical Institute for multi-channel stainless filters will be used in industry when the stainless steel powder will be industrially produced.

This technology, which uses imported powder or powder made in the atomizing installation at the Institute, consists of:

--sintering the stainless steel powder pressed to thicknesses of 0.5-3mm in dry hydrogen at 1360 degrees Centigrade, with or without further machining;

--determing the properties of the plates;

--deformation of the plates (bending, drawing, forming, or sleeve-making)

--electric welding or welding in Argon;

--assembling (cover, bottom, reinforcement) according to pressure, with or without support.

The filters are used for the filtration of corrosive substances at temperatures up to 550 degrees C; they are flame resistant and retain particles above 3µm (25-50µm).

The following user industries have tried out these filters and porous plates:

Chemical Industry:

--air (for A.M.C.) [expansion unknown]; water (with bayonet filters in series); solvents (benzene, toluene, etc.), air-methane for the hydro-cyanic acid factories;

--air-ammonia (chemical fertilizer combinates);

--polymer melts, pure polyethylene, polystyrene, polyamide.

Aeronautical Industry:

--fuels

Nuclear industry:

--ammonia diuraniate, uranium dioxide;

Machine building industry:

--suspensions (ferrites);

--lubricants (oil).

Various types of flame arresters for explosive mixtures have been developed and sent for testing:

--acetylene--air for welding installations;

--hydrogen-oxygen, deuterium--oxygen for the heavy water factory.

So far, experimental batches of plates were produced and delivered for the study of welding in Argon and for the experimental production of filters. Studies were also carried out to determine the characteristics of the sintered filtering plates made of powders with various granulations. These characteristics are: porosity, permeability, and the influence of the degree of compating on the dimensional precision and on the degree of filtration.

Successful experiments were carried out with small sintered plates made of stainless powders and pressed in a magnetic field with orientation of the ferrites; this established the suitable filtering materials. Operational testing of filters continues in order to define the technology.

Porous, Ag-Zn Electrodes.

The development of porous electrodes for electrochemical energy sources, generally for high performance batteries for aviation, are the result of many years of research at the institute.

Rolled Sheets and Strips.

Research was carried out to introduce in Romania the process of roll compacting metal powders, for products such as:

--strips for electrotechnical purposes, based on iron-nickel, with several alloying elements with a precise thermal expansion. These materials, whose expansion coefficient is $9\ 10^{-6}$ --same as that of glass and of platinum--serve to form anodic contacts for picture tubes. It is necessary to perfect the technology in order to achieve maximum compaction (100 percent) after rolling and also to study, in parallel, the classical technology using a compact strip.

--highly alloyed strip-electrodes for welding, for plating under a layer of flux needed in the machine building industry and in the nuclear industry.

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ROMANIA

IMPORTANCE OF SCIENCE, TECHNOLOGY TO COUNTRY'S DEVELOPMENT

Bucharest ERA SOCIALISTA in Romanian No 5, 10 Mar 85 pp 17-21

/Article by Adrian Magureanu: "Science as a Powerful Force for National Progress and Prosperity"/

/Text/ As Nicolae Ceausescu said, "Scientific research and rapid and consistent application of the research results and the new advances of modern science and technology to production have a vital part to play in implementing the program for socioeconomic development in the next five-year plan." And as it says in the Manifesto of the Socialist Democracy and Unity Front, "When you vote for the candidates of the Socialist Unity and Democracy Front, you are voting for its even greater contribution to the nation's all-around development, to growth of the national wealth, and to the general improvement of socialist Romania's prosperity and civilization!"

Science and technology play a decisive part today in rapid development of the productive forces and in invigorating every country's all-around progress and entire economic and social activity. The current technical-scientific revolution makes it possible to "compress" the developmental stages by shortening the time it takes to reduce and close the economic gaps. But it also requires sustained efforts to apply the gains in scientific knowledge and the new advances of technology to production promptly.

As a rapidly developing socialist country, Romania is vitally interested in building and developing modern structures of its national economy that can permit high levels of labor productivity and per capita national income and the resulting continuous improvement of the public's material and cultural welfare. Attainment of these vital goals as well as socialist and communist construction are inherently dependent upon development of scientific research and the increasingly intensive growth of the contribution of Romanian science to the nation's all-around development. As Party General Secretary Nicolae Ceausescu said at the National Conference on Scientific Research and Design in 1984, "A decisive contribution to fulfillment of the high social ideals that inspire the Romanian people is to be made by science and technology and by increasingly profound knowledge of the objective laws of nature and the sequences of social development. That is why science is inseparably bound up with the basic aims of the RCP and the Romanian people and with the noble cause of building the new social order on Romanian soil."

The rapid all-around progress that Romania has made in all fields, including science and technology, in the 20 years since the Ninth Party Congress, the most productive and fulfilling period in all Romanian history, is inseparable from the bold revolutionary thought of Nicolae Ceausescu, the leader of the RCP and the Romanian state, and his tireless and noteworthy activity steadfastly in the service of the Romanian people's vital aspirations. The great changes made in Romanian society during those two decades are due to the innovating spirit introduced in all socioeconomic activities and to scientific treatment and solution of the major problems of socialist revolution and construction. By categorically opposing any instances of dogmatism in social activity or in political thought, the Ninth RCP Congress opened up a broad field for creative application of the principles of scientific socialism in full accord with the vital needs of construction of the new society on Romanian soil.

Pursuant to the guidelines set by the Ninth RCP Congress, an extensive effort was begun to organize scientific research and technological development by drafting the five-year and annual research plans uniformly, by developing the necessary material and manpower resources, and by reorganizing and expanding the scientific and technological research units. The National Council for Scientific Research was founded, which was the first insititution of its kind in Romania's history, and it became the National Council for Science and Technology in 1969.

Organization of the research network in all economic sectors and in the basic natural sciences, the measures taken for better concentration of the research forces, and continuous and diversified encouragement of original creative scientific work permitted noteworthy progress in research and procurement of the technological resources for modern industry and agriculture, making it possible to keep improving labor productivity and to raise the entire people's living standard accordingly.

Following the example of the Central Institute for Chemistry, which was founded at the suggestion and under the direct supervision of Academician Dr Eng Elena Ceausescu, central research institutes and academies of science sprang up in various fields, integrating all departmental research units under single managements, including the plant research laboratories for technological engineering and design and the specialized university departments. This eliminated the duplications in research, which were causing a great waste of research forces, and concentrated the personnel and material and technical resources upon the major problems of the state plan, while expediting the studies, experiments and designs. This integration also brought about an increasingly close coordination of research with education and production that led to a correlation of basic research with the national economy's needs, to more efficient use of the technical-scientific capacities of the workers in higher education, to curtailment of the research-production cycle, and to improvement of the students' theoretical and practical training.

Party General Secretary Nicolae Ceausescu regards close integration of research with education and production as an objective necessity and a first requirement both for the progress of Romanian science and for the adjustment of public instruction to the demands of the technical-scientific revolution and the necessities of life and for increasingly intensive incorporation of scientific advances in material production and in all social activity. The annual plans for research, development and technical progress include many objectives today to which professors, lecturers, project heads, assistants and students are contributing as subject coordinators but particularly as collaborators in various stages of investigation. If the 13th Party Congress' decisions are to be implemented successfully, this coordination of university departments with research and production must be even closer and more direct, so that the creative power of higher education will contribute even more actively to the solutions of the problems facing the economy. Understanding of this necessity is vital now that accelerated technical progress is a critical requirement for production and an essential for greater economic effectiveness. It is accordingly necessary to make a more determined start in applying the party leadership's direction to form composite collectives of specialists in research, education, design and production to define the tasks of technical progress specifically in every central and enterprise and to take firm action to fulfill those tasks.

The material and manpower resources for scientific research and technological engineering were intensively developed through consistent pursuit of the policies and goals set by the party and state administrations during the period following the Ninth RCP Congress. Accordingly the resources for investment projects and development of the research capacity are 17.4 times greater in 1985 than in 1965. The volume of research work in terms of material outlays was over 9 times greater in 1980 than it was in 1965 and it is 14 times greater in 1985. The number of personnel employed in research, technological engineering and design exceeded 200,000 in 1980 or 8 times more than in 1965, and it is now about 245,000.

With these very effective material and manpower resources rapidly developed over the last two decades, the results of the studies made in various areas of the economy were promptly applied to production and led to renovation and modernization of the technologies, mechanization and automation of the operations, and development of new machines, equipment, instruments and installations as well as new consumer goods and materials. This renovating process is evidenced by the fact that by the end of every five-year plan during this period about half of the products manufactured by national industry were new or modernized and about 98 percent of them were based upon Romanian designs.

The objectives of scientific research, technological development and introduction of technical progress that were taken up, accomplished and applied to production or social activity were entered in the five-year or annual plans on the basis of in-depth analyses made with the aid of the most representative specialists in research, production, education and the administrative and coordinating organs. These objectives reflect the urgent needs of the various economic sectors and largely concern material production. They are primarily intended to develop the national potential for raw material and energy reserves and to make use of new energy sources; to raise labor productivity and lower production costs; to develop and assimilate new machines and installations as well as consumer goods and materials; to make increasing use of recoverable materials; to reduce the inputs of raw materials, materials and energy considerably by rational use and management; and to enhance the competitiveness of Romanian industrial products for export and cut down considerably on imports. An important part is also played by the objectives intended to develop the basic sciences, namely physics, chemistry and biology, mathematics, data processing and cybernetics, and the economic, historical and philosophical sciences.

In his address to the Expanded Plenum of the RCP Central Committee of June 1982 Nicolae Ceausescu said, "In the course of the current five-year plan the vitality of the Romanian economy critically depends upon greater labor productivity, further growth of the net industrial output and of agricultural production, and maximum sales of Romanian products on the world market. We must secure more intensive development of science as a spur to socioeconomic development, that of domestic raw-material and energy resources, and that of agriculture, as sectors vital to construction of the fully developed socialist society and the advance toward communism." Consistently pursuing this policy set by the party general secretary, the plans for scientific research, technological development and introduction of technical progress have included the objectives that stem from the special programs drafted by the National Council for Science and Technology jointly with the ministries concerned. A large proportion of the objectives are from the programs for building nuclear-electric power plants, obtaining new sources of heat and electric power, reducing imports, and producing materials for the electronics, electrical-engineering and microelectronics industries as well as the aeronautics industry. Objectives are also included to implement the provisions of the special programs concerning exploitation of useful substances in poor deposits, development of the recovery factor of crude oil in deposits, marine and depth drilling, production of synthetic fuels and motor fuels, and manufacture of intermediate products for drugs, dyes, paints and varnishes, as well as the provisions of the special programs for agriculture and zootechnology.

In view of the demands of the new stage of Romanian society's development and the critical importance of science to construction of the fully developed socialist society and the transition to communism, the 12th Party Congress placed priorities on Romanian science and technology by ratifying the Program-Directive for Scientific Research, Technological Development and Introduction of Technical Progress in the 1981-1990 Period and the Major Aims up to 2000," drafted with Nicolae Ceausescu's regular guidance and under Academician Dr Eng Elena Ceausescu's direct and highly competent supervision. The program calls for a direct contribution from research to the solutions of all problems in connection with efficient implementation of the provisions of the plan for Romania's socioeconomic development in the current five-year plan, as well as its technical solutions needed to carry out the guidelines for the 1986-1990 period, even further enhancing the role of science in the whole task of socialist construction so that this decade will become a true decade of science, technology, quality and effectiveness. The program also calls for formation of the reserve of scientific discoveries and technological solutions essential to Romania's long-range development up to 2000, always on the basis of the most advanced gains of the contemporary scientific-technical revolution.

The tasks flowing from the program-directive for scientific research, the program-directive for energy, and the programs approved by the National RCP Conference in 1982 were basic to the research and development objectives and those of technical progress that are entered in the 1981-1985 Five-Year Plan and in the respective annual plans.

Accordingly the tasks for research and development and technical progress that are included in these plans are primarily intended to develop the energy base by efficient use of the domestic energy resources and the new sources of heat and electric power, fuels and motor fuels; to develop the raw material base by economic exploitation of new deposits as well as extraction, enrichment and economic exploitation of ores poor in useful substances; to make complete use of raw materials and materials, secure better processing and exploitation of technological by-products, and intensify recovery of mineral reserves; to apply scientific-technical research findings to agricultural and zootechnical practice in the course of completing the agrarian revolution and expand genetic engineering projects to obtain highly productive varieties and hybrids; to exploit the biomass by means of biotechnologies, obtain petrochemical products and motor fuels, and expand bioengineering crops; to improve the quality and competitiveness of all products and services by developing efficient manufacturing technologies and processes and introducing them into production; to enhance labor productivity by expanding mechanized operations in various activities, by automating production processes, and by applying automated data processing to the management, planning and control of activity in various sectors of the national economy; to raise the technical and qualitative levels of production and diversify it in order to reduce imports and make the products more competitive; to improve the production processes in order to make greater savings in materials and lower the specific inputs of raw materials, fuels and energy; to complete the construction program by developing and perfecting technological and construction procedures for building dwellings and economic and social capacities; and to develop basic theoretical research in mathematics, physics, chemistry, biology, medicine, agriculture, construction and other fields in order to form a reserve of Romanian scientific procedures needed to solve some long-range technical and economic problems, develop scientific knowledge, and clarify some new secrets of nature.

Thanks to the sustained efforts of all the workers in research, education and production, over 13,500 new and modernized machines, tools, devices and installations were placed in manufacture in 1981-1984, and about 4,100 new consumer goods and materials were put into production. Furthermore, over 5,000 new and perfected technologiès were applied. These important achievements of scientific research and technological development were clearly presented in Academician Dr Eng Elena Ceausescu's speech at the 13th Party Congress: "It may be said that we now have strong research units in all activities and that the great achievements in industrial and agricultural development and in all fields are heavily dependent upon the active contribution of Romanian science, which in this five-year plan alone developed over 5,000 new technological processes for various activities, while actively contributing to better use of raw materials, to reduced inputs, to typification, regulation and standardization of products, to technical and qualitative enhancement of production, and to the greater efficiency of all economic activity."

The plan for scientific research, technological development and introduction of technical progress for the 1986-1990 period will emphasize the tasks set in the Directives of the 13th Party Congress for continued intensive development of the productive forces and the technical-material base and for implementation of the RCP Program for Building the Fully Developed Socialist Society and for Romania's Advance Toward Communism.

As Nicolae Ceausescu pointed out in his masterly Report to the 13th Party Congress, in the next five-year plan the whole evolution of Romania's socioeconomic activity will be characterized by intensive development of the role of science and technology in all activities, in order to provide for raw material resources, develop agriculture on a modern basis, raise the technical and qualitative levels of production, and improve the quality of life. And so while functioning effectively as a directly productive force, science will also emerge more and more in the next five-year plan as a means of scientific management and organization of all socioeconomic activity.

In direct connection with the more and more pronounced increase in the contribution of research, development and technical progress in all sectors of the national economy and of social activity, it is planned to further intensify the action of the qualitative factors in economic development. To that end a considerable gain in labor productivity will be specially emphasized. The Program for Greater Labor Productivity and Improved Organization and Standardization of Labor in the 1983-1985 Period and up to 1990 will raise the growth rates of labor productivity in stages so that there will be a gain of 29 percent in 1985 from 1980, in 1986-1987 industrial labor productivity will be 1.7 times greater than in 1980, and in 1990 it will be 2 times greater.

Growth of labor productivity is based especially upon introduction and generalization of technical progress, the proportion of that activity in all the factors for fulfillment of the planned objective being 52 percent in 1985 and 55 percent in 1990. Emphasis will be placed on introduction of composite automated production lines and machines and automation means including manipulators, microprocessors and industrial robots. Their use will be based upon in-depth technical and economic analyses to secure a high economic effectiveness in all activities. Highly important tasks are assigned for this purpose to various activities (the mining extractive industry, the petroleum and gas extractive industry, and the metallurgical, machine building, chemical, petrochemical, construction materials, light and other industries) both in mechanization and automation of the production processes and in introduction of new and modernized technologies that will result in considerable growth of labor productivity.

Moreover as regards research and development, it is intended to raise the technical and qualitative levels of production, to reduce the inputs of raw materials, fuels and electric power, and to further intensify the exploitation of raw materials, materials, fuels and energy. Redesign and modernization of the products in current manufacture are to be intensified in keeping with the tasks set in the Program for Technical and Qualitative Improvement of Products, Reduction of Raw Material, Fuel and Energy Inputs, and Better Use of Raw Materials and Materials in the 1983-1985 Period and up to 1990. It is intended to improve the designs of products in course of assimilation and to enlarge the manufacturing assortment by making highly technical products, in order to raise the proportion of products up to high world standards to about 69 percent in 1985, 84.6 percent in 1987, and close to 95 percent in 1990. Moreover between 2 and 5 percent of the products will be above world standards.

In order to carry out the Program for Development of Energy Resources up to 1990 research will concentrate primarily upon providing the technologies and equipment needed to produce energy from the main traditional sources of this decade, namely coals, hydroelectric power and nuclear energy. In the field of nuclear energy engineering in particular, the first and most vital task of research, engineering and design will be to implement the aims of the special programs for nuclear materials, moderators and fuels punctually and efficiently, and also to help in making the equipment for the nuclear part and the conventional part of the Cernavoda nuclear-electric power capacity. And in view of the increased tasks of the nuclear program, the research and engineering operations to provide in advance for installation of the planned capacities by the end of the decade will be reproportioned and accelerated. Moreover it is very important to considerably intensify domestic industry's assimilation of materials and equipment for nuclear-electric power plants.

Alongside the efforts to increase energy production, a large volume of research and technological engineering projects will be undertaken for maximum conservation of energy and fuels and also for their most economically efficient use. The consumption norms will be reviewed periodically on the basis of the studies to rationalize the technologies and installations. Replacements and improvements of technologies as well as redesign of some products will considerably lower the inputs of energy and fuels, especially in the production sectors with highly energy-intensive technologies like metallurgy, chemistry and construction materials in view of the planned increases in the outputs of those sectors.

Measures will be studied, according to economic sectors and areas of consumption, to replace consumption of energy and fuels of higher quality with forms of energy of inferior quality, chiefly inferior solid fuels, recycled energy and energy obtained from new or regenerable sources. Discovery and generalization of technical measures to make major savings in petroleum products will be specially emphasized. Moreover the application of strict and rational energy criteria to the program to standardize products, technologies and constructions will be expanded and intensified. Research and engineering will have a critical part to play in determination and generalized application in practice of measures to recover used energy in various consumption sectors (heat from gases, liquids and combustible semifinished and finished products, water and air used in technologies, and wastes with energy value), especially by wide-scale use of air heaters.

In the field of new and recoverable energy sources, research and engineering will speed up the efforts to enhance and increase the economic effectiveness of the measures already devised in order to make better use of those energy sources by means of more advanced measures that can supply higher-quality energy for economical industrial applications especially.

The researchers and designers, working with the production specialists in the composite operational collectives, will be of direct help in eliminating the defects and in solving numerous current technical problems in the energy sector. It is necessary to provide for maintenance of the energy equipment of coal-based thermoelectric power plants in operation at the required parameters, generalization of proven technical measures, maintenance and improvement of the quality of the coals, curtailment of stoppages for maintenance and repair of energy equipment, and more rapid assimilation of spare sparts vital to proper operation of the machines and equipment.

Research and technological engineering have important tasks in more intensive development of domestic raw material resources and maximum exploitation of all domestic resources. Increasing the variety of the resources and the volume of the reserves will be heavily emphasized. New technologies will be investigated for this purpose that can provide for efficient and profitable economic application of resources difficult to exploit, resources poor in useful content, and resources recoverable from substances used in technologies. An effort will be made to enhance the effectiveness of prospecting and exploratory operations, while expediting transition from the stage of investigation to use of the discovered reserves in production.

Development and generalized application of new technologies will also be emphasized, leading to lower inputs of raw materials and materials per unit of output in order to make a real leap in intensified use of all raw materials, materials and semifinished products. A whole series of technologies and technical-economic measures will be instituted for maximum intensification of the use of every ton of raw material and for exploitation of all useful components and all technological by-products. Every enterprise processing raw materials, materials and semifinished products will draft specific programs, with the direct aid of the respective research institutes, to replace technologies and supplement and perfect the production lines so that every ton of raw material or material processed will be practically entirely exploited within the shortest possible time. To that end, new measures are required for more intensive output and use of the metals, improvement of the casting and cutting technologies with an eye to maximum conservation, and strict conservation and complete recovery of nonferrous metals in the course of processing them.

As a whole, scientific research and technological development also include highly important objectives that will permit optimal implementation of the new agrarian revolution so that crop and livestock production and that of the food industry will be considerably increased. Multi-purpose machines will be built for a mechanization of agricultural operations that will eliminate multiple passage of agricultural machines over cultivated lands, thus preventing modification of the soil structure by settling and also considerably reducing fuel consumption in that way.

It is intended to provide new types of fertilizers for agricultural chemization, especially those containing microelements as well as pesticides and herbicides and particularly those permitting destruction of the weeds in cultivators. A wide assortment of products will be made for the fodders used in industrial zootechnology, especially proteins, the most useful amino acids, vitamins, mineral salts and antibiotics, as well as many other veterinary drugs that eliminate epidemics bringing mass destruction under the conditions of large concentrations of livestock and poultry in modern zootechnology. On the basis of some excellent studies, modern methods of genetic engineering and the recombined ADN technique are to be used in obtaining some highly productive plant varieties and hybrids and breeds of livestock and poultry.

Now that we have well-directed and substantiated plans and programs for scientific research, technological development and introduction of technical progress that are firmly anchored in the realities of the national economy and entirely suited to the needs of its development, the main requirement is to secure the even more intensive mobilization of all research forces for exemplary fulfillment of the tasks, so that science and technology will make as substantial a contribution as they can to Romania's economic and social progress and to imprementation of the magnificent Program for Building the Fully Developed Socialist Society and for Romania's Advance Toward Communism. In this spirit, the Manifesto of the Socialist Unity and Democracy Front for the elections of 17 March appeals to the scientists and researchers to work tirelessly, by developing the rich traditions of Romanian science, "to promote the latest scientific advances in all sectors of the national economy and society and to make better use of the national resources on behalf of the progress and prosperity of socialist Romania! Do all you can for the most effective advancement of original Romanian scientific thought and technology and for the constant growth of its contribution to the treasury of universal knowledge!

The swift development of production in our time keeps enhancing the role of science as a directly productive force while the information explosion is extending knowledge into the microstructure of matter, the biostructure of life, and the cosmic macrostructure of the universe, constantly enhancing the role of science in developing and asserting the advanced conception of the world, nature and society. Based upon the notable results already obtained and the RCP's realistic and profoundly scientific policy, the guidelines and goals set by the 13th Party Congress for Romania's long-range socioeconomic development on the basis of the most important scientific and technological advances open up new and bright prospects for the progress of Romanian society. Their fulfillment is a cause of the entire people. As Nicolae Ceausescu pointed out in the Report to the 13th RCP Congress, "We must fully realize that Romania's socioeconomic development and communist construction are possible only on the basis of the latest advances of science and technology and of human knowledge in general."

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