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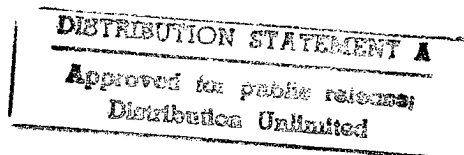


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# ***JPRS Report***

# **Science & Technology**

## ***USSR: Science & Technology Policy***



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# Science & Technology

## USSR: Science & Technology Policy

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**USSR Law on State Enterprises (Associations)**

*Moscow MASHINOSTROITEL in Russian No 9 Sep 87  
pp 1-4*

[Article by V. P. Demin: "USSR Law on State Enterprises (Associations)"]

[Text] The June (1987) CPSU Central Committee Plenum formulated the political, economic and legal basis for creating an integrated system to manage the economy. The radical restructuring of the management of the national economy is a key task in implementing the 27th CPSU Congress's strategic course for accelerating the country's social and economic development and qualitatively renewing all facets of Soviet society. It is foreseen that there will be extensive democratization of the leadership of the national economy, the general development of the masses's creativity and the activation of the human factor, an expansion of enterprise independence and their conversion to full cost accounting, self-financing and self-management. There are qualitative transformations of planning, the economic stimulation system and management organization.

Measures to restructure the national economy's management, intended for the present stage in the country's economic development, are directed towards more completely discovering socialism's potential, making the economy highly dynamic, flexible and receptive to scientific and technical progress. Many elements in the new approach to managing the economy have been tested in practice and have been widely supported by labor collectives.

The USSR Law "On State Enterprises (Associations)" approved by the USSR Supreme Soviet is of major significance in implementing the intended transformations. This is a document of huge political importance. It reflects the party's strategy for the present stage and consolidates the radical changes in operating conditions and the conversion to primarily economic methods of management. There are sizable expansions in the limits of independence in production and social spheres. Enterprises' responsibilities are increased. They have completely guaranteed rights flowing from their leading role in socialist production.

This law defines the economic and legal basis for the organization and economic activities of state enterprises (associations). It is directed towards strengthening state (public) ownership of the means of production in industry, construction, the agro-industrial complex and other sectors.

There is a deepening of the centralized basis for solving the most important tasks in developing the national economy as a single whole. At the same time there are provisions to intensify economic methods of management, the use of full cost accounting and self-financing and a deepening of democratic foundations and the development of self-management. There are expanded

possibilities for labor collectives' participation and an increased role for them in managing enterprises and solving state and social problems. The relationship between enterprises and organs of state power and administration are defined.

The USSR Law is directed towards creating the organizational and economic conditions under which labor collectives and each worker will really become genuine masters of production and be concerned about strengthening discipline and order and increasing national wealth.

The USSR Law reflects the activities and experience of many progressive enterprises throughout the country and all the better creations of the masses. An active and concerned general discussion of the draft of this Law made it possible to enrich it with new norms and to make it more precise and concrete. The discussion took place under conditions of full glasnost, a businesslike examination of all facets of enterprise activities and a critical analysis of the situation. During this discussion there were more than 140,000 suggestions and comments, which were carefully studied. As a result there were substantial additions, changes and refinements to the draft, making it possible to more precisely formulate enterprises rights and responsibilities.

Like all Soviet people, machine builders approvingly accepted this USSR Law and completely share and support its principles.

It is intended to begin the transformation of the economic management mechanism with the basic components of the economy — enterprises performing the main economic processes and where people's labor creates the needed products and services and materially embodies scientific and technical thinking. State enterprises, together with cooperatives, are the basic component of a single national economic complex. They have the main role in developing the country's economic potential and in achieving the highest goals of public production under socialism — the most complete satisfaction of the people's growing material and spiritual needs.

An enterprise's labor collective creates and increases national wealth, assures the combination of the interests of society, the collective and each individual. This makes possible a more advanced realization of socialist property relations, enhances the worker and employee interests in increasing national wealth and educates people in having a genuinely responsible attitude towards it.

This USSR Law formulates the principles of enterprise activity. The law provides for enterprise activities to be based upon a state plan for economic and social development, a most important instrument for implementing the economic policies of the Communist Party and the Soviet State. Guided by control figures, state orders, long

term scientifically based economic normatives and limits, as well as by customers' orders, an enterprise independently works out and approves its plans and signs contracts. It is stressed that enterprises operate on the principles of full cost accounting and self-financing. Its production and social activities and payments for labor are paid from monies earned by the labor collective. Profits or income are a general indicator of enterprise economic activity. The monies earned by the labor collective can be used to modernize production and improve social conditions and material incentives. This increases the collective's and each worker's interest in work.

The USSR Law places primary significance upon strengthening the democratic basis of labor collective activities, improving production efficiency and product quality and stimulating socialist entrepreneurialism.

Enterprise activities under conditions of full cost accounting and self-financing take place in accordance with the principles of socialist self-management. The labor collective, having full rights as master of the enterprise, independently solves all questions of production and social development. Achievements and failures in the enterprise's work directly affect the collective's cost accounting income and each worker's welfare. A new economic category, cost accounting income, will become the main source of payments for labor and for material incentives, the production development fund, the science and technology fund and the social development fund. This will promote collectives to economize on material and labor resources and to improve labor productivity and product quality.

Economic competition between enterprises will become an important means for further developing initiative and strengthening interest in the final results from labor. This new form of socialist competition is directed towards the fullest satisfaction of customer demand for efficient, high quality and competitive products (and work and services) at the least cost. Enterprises producing and selling the best products (and work and services) at less cost obtain higher cost accounting income and advantages in their production and social development and in paying for workers' labor.

The state promotes the general development of socialist competition between enterprises, limiting their monopolistic situation as producer of a specific type of product (or work or service).

In order to carry out the tasks in this USSR Law, enterprises are given full legal power to make all decisions at their own initiative, if this does not contradict existing legislation. They also bear full responsibility for observing the state's interests and citizens' rights. Neither should such activities disturb the normal working conditions of other enterprises and organizations, nor harm citizens' living conditions.

The USSR Law touches upon practically all facets of the life and activities of enterprise collectives. Enterprise management is based upon democratic centralism and the combination of centralized leadership and socialist self-management of the labor collective.

Socialist self-management is carried out under widespread glasnost through the participation of the entire collective and its public organizations in working out the most important decisions and monitoring their execution and through the election of management. Democratically based one man management of enterprises is retained and strengthened. Thanks to self-management, workers efforts and initiative are directed towards attaining good results, giving workers a sense of organization and discipline and raising their political consciousness.

The enterprise party organization, the political nucleus of the collective, operates within the USSR Constitution and directs the work of the collective, organs of its self-management and other public organizations and monitors administration activity.

Social and economic decisions concerning enterprise activity are made by its management with the participation of the collective and public organizations. The introduction of elections for management (as a rule on a competitive basis) is a big step in expanding the full legal powers of the collective. It makes it possible to improve the quality of management cadre and to increase their responsibility for results. The principle of election to office is to be applied to managers of enterprises, structural units in associations, production operations, shops, divisions, sections, foremen and brigade leaders.

The managers of enterprises and structural units of associations are elected by a secret ballot or voice vote of the general meeting (conference) of the labor collective (at the discretion of the meeting or conference) for a period of five years and approved by higher organs. If the candidate elected by the labor collective is not approved by higher organs there are new elections. The higher organ is obligated to explain to the labor collective the reasons for the refusal to approve election results. Enterprise and association unit managers can be removed from office before their term expires by higher organs on the basis of a decision by the general meeting (conference) of a labor collective or its proxy — the council of the labor collective.

The manager of the main structural unit (main enterprise) elected by the labor collective, is approved by the higher organ to occupy the post of association manager. If an association is managed by a special apparatus, the association manager is elected by a conference of representatives of unit and enterprise collectives. A manager is removed from office prior to term expiration by the same procedure as for an enterprise manager.

The managers of subdivisions (production operations, shops, divisions, sections, and foremen and brigade leaders) are elected for five year terms by the appropriate collectives by secret ballot or voice vote and approved by the enterprise manager. They can be removed from office before their term expires by a decision of the collective involved. The election of managers does not contradict the principle of one man management as, in accordance with the principles of self-management, the enterprise manager reflects the interests of the state and the labor collective.

This USSR Law contains new provisions reflecting the needs of social development. It states that the main form for exercising the labor collective's full authority is the general meeting (conference), the role of which grows considerably. The labor collective meeting examines the most important questions in enterprise activity: it approves economic and social development plans, the collective contract, assumes socialist obligations, approves labor regulations presented by the administration and trade union committee, etc.

During the time between meetings (conferences) the labor collective's full authority is exercised by the council of the enterprise (unit) labor collective. The council focuses attention upon developing workers' initiative and increasing the contribution of each worker and upon taking measures to obtain good final results from enterprise activities and cost accounting income for the collective.

The labor collective's permanently operating organs — the councils — are given broad authority permitting them to actively influence all facets of the life of enterprise. They also monitor the implementation of decisions by the general meeting, response to critical comments and suggestions by workers and employees and participate in solving questions in improving enterprise management and organization, monitor the use of funds (production development, science and technology, material incentives, social development and others). It should be noted that labor collective council decisions within the limits of its authority and in accordance with legislation are mandatory for the administration and labor collective members.

The labor collective council is elected for 2-3 years by a general meeting (conference) of the collective by secret ballot or voice vote. The size of the council is determined by the general meeting (conference). The number of administration representatives cannot exceed one fourth of total council members. At least one third of the council is replaced with new members at regular elections. Labor collective council members perform their functions on a public basis. They cannot be removed or subjected to other disciplinary actions without the labor collective council's agreement.

Article 9. in this USSR Law covers relations between the enterprise and higher organs and local Soviets of People's Deputies. All organs of state power and management should promote the economic independence, initiative and socialist entrepreneurialism of enterprises and their labor collectives. In all their activities higher organs are obligated to provide conditions for enterprises' efficient operation, strictly observe their rights, assist in their full exercise, not interfere in enterprises' day to day activities and inform the labor collective of their activities. A higher organ can give enterprises instructions only within its legally established competence. Higher organs are liable for losses born by enterprises as a result of implementing instructions from higher organs or from higher organs' unreliable implementation of their obligations to enterprises.

Radical changes have been made in the nature of enterprise planning activities. One fundamentally new feature is that they will independently work out and approve five year and annual economic and social development plans. The needs of society and the interests of the state in output should be met by economic methods using control figures, state orders, long term stable norms and limits. Control figures do not have a directive character and will not be used to evaluate enterprise activity. State orders form a program only for the most important types of products. The remaining assortment part of the production program is formed by enterprises independently, based upon direct economic ties with customers.

This USSR Law orients labor collectives towards maximum receptiveness to innovations, the efficient use of production potential, increased shift coefficients for equipment operation, its steady replacement with progressive technology and towards interest in using scientific and technical achievements.

Under the provisions of this Law enterprises are freed from detailed top down regulation of science and technology planning. This law removes restrictions on the number of plant scientists, designers and technologists, their wages fund and the conditions for stimulating their labor.

There is a considerable expansion of enterprise rights and independence in social development, which is made to depend directly upon work results. The most important directions in enterprise activity should be an active social policy, concern about improving working and living conditions, meeting the interests and needs of its workers, their families and veterans of war and labor.

USSR law regulates the procedure for setting up and terminating enterprise activities. In cases of reorganization and liquidation higher organs guarantee released workers their rights provided by the USSR Constitution and legislation. Not less than two months prior to an enterprise's reorganization or liquidation workers are personally informed of the time of their release. During

the period they are looking for employment, but not more than three months, they earn the average wages and are in continuous labor service.

In accordance with the USSR Supreme Soviet Decree of 30 Jan 1987, this law goes into effect on 1 January 1988. Its provisions apply to enterprises, associations and organizations in material production, which have been converted to full cost accounting and self-financing. Extensive work must be done on publicizing and studying this Law, on clearly understanding the intent and purposes of the restructuring of the economy and on mastering the new methods of operating. To do this it is necessary to improve the work of economic managers, generally support high production efficiency, initiative and socialist entrepreneurialism among cadre, enhance their responsibility for their work.

Each labor collective member should clearly and concretely pose new tasks for himself, actively participate in implementing this law, learn to work creatively under conditions of full cost accounting and self-financing, democratization and widespread glasnost. Putting this law into effect will permit the labor collective to discover its creative potential, and reach higher frontiers in economic and social development.

11574

**Meeting on Interbranch Complexes Held in Kiev**  
*18140205a Moscow NTR: PROBLEMY I RESHENIYA*  
*in Russian No 13, 7-20 Jul 87 p 2*

[Article by V. Moiseyenko, candidate of technical sciences, and V. Prilyuk, candidate of economic sciences: "Interbranch Scientific Technical Complexes—Duties Without Rights"]

[Text] A discussion of problems concerning the improvement in the management of interbranch scientific technical complexes was held at the Republic Center for Economic and Scientific-Technical Propaganda in Kiev. Three institutes of the UkSSR Academy of Sciences—cybernetics, electric welding, and problems concerning the study of materials—became the initiators of the seminar.

All the participants in the seminar unanimously agreed that the existing standard statute on interbranch scientific technical complexes did not serve as a reliable sailing direction for blazing a trail from science to series production. The discrepancy between the tasks of and the legal and economic support for the activity of interbranch scientific technical complexes hampers their consolidation. For example, to introduce developments into series [production], there is a need for production capacities, which ministries have. However, sectorial staffs repeat over and over again that capacities are needed for plan fulfillment, not for experimental production.

Resources are another problem. According to the statute they should be allocated by ministries, which usually do not rush to do this. As a result, obtaining resources resembles a tug-of-war between the management of sectors and interbranch scientific technical complexes and the winner here is often determined by the level of previous services and "go-getting" qualities, not by an efficiently operating procedure.

A great deal is still unclear in the system of management within interbranch scientific technical complexes. As is well known, they include organizations of a varying departmental subordination remote from each other. How to organize an operational interaction between them? How to plan efficient organizational structures and processes of managing them? What are interbranch scientific technical complexes—miniministries, maxiasociations, or something else?

Experience in organizational planning in the sphere of interbranch complexes already exists. Professor G.M. Dobrov, director of the Center for Research on the Scientific Potential and History of Science of the UkSSR Academy of Sciences, discussed this. However, as the speaker stressed, obviously insufficient attention was paid to this aspect of organization of interbranch scientific technical complexes. As a result, a great deal is completed "on the go". Everyone does this in his own way, which is not always the best.

There is an urgent need to organize a regular exchange of experience and its analysis and generalization.

Significant and interesting experience has already been accumulated. For example, the Institute of Electric Welding imeni Ye.O. Paton of the UkSSR Academy of Sciences, which is an interbranch scientific technical complex, has established a department for ensuring the quality of developments controlling the course of work ranging from a technical assignment to the organization of series output. Banks of data on the technical level of world analogs, topics of research by the complex, and the list of accessories have been formed here. Business meetings are held with the management of ministries, where problems of support and circulation of innovations are solved. Proposals on a change in the procedure of providing incentives for plants manufacturing products developed by the interbranch scientific technical complex have originated. Its essence lies in the fact that the entire profit should be left at an enterprise for 3 years from the day of output of a new article and then be lowered by 50 percent. This should stimulate the industry to search for innovations.

The report on the practical experience of the Intersectorial Center for Programming Technology, which functions at the Institute of Cybernetics imeni V.M. Glushkov of the UkSSR Academy of Sciences, evoked interest. Although legally the center is not an interbranch scientific technical complex, in fact, it represents such a complex established on the basis of "shares" by four

ministries. In this center, in contrast to the interbranch scientific technical complex, there is no introduction problem, because shareholder ministries consider development results their own.

The meeting in Kiev has shown that the spectrum of problems concerning interbranch scientific technical complexes is very broad and their solution is impossible without restructuring at all levels of management—from the enterprise to the Gosplan.

11439

### **New Strategy Aims for Self-Reliance in Computer Technology**

36200040 Duesseldorf *HANDELSBLATT* in German  
9 Dec 87 p 10

[Article by Volkhart Vincentz: "Moscow Looks for New Directions in Computer Production—USSR: Increased Efforts in Supercomputers"]

[Text] The new technology policy under Gorbachev has led to a diversion from the past development strategy in the Soviet computer industry. For some time, development of original prototypes has been avoided and, instead of that, models of the leading Western suppliers, particularly IBM and Digital Equipment, have been depended upon.

This policy should now favor original development. An inventory of the past "buy-and-spy" policy indicates that it lead to unexpected difficulties in implementing Western construction with Soviet components, the expected savings through the adoption of software were overestimated, and that catching up (to the West) has been pushed way back by the acceleration of technological development.

The Soviets are, by their estimate, at least four to six years behind the West, and the more pessimistic estimates of Soviet computer experts range from ten up to fifteen years.

### **The Organization Must Be Rebuilt**

The reemphasis of the Soviet Union on their own capabilities is most apparent in the increased efforts placed on development of supercomputers. The current concentration on the highest class of computers has several origins. For one, there are ever more stringent restrictions by Western countries in this highly sensitive military area.

This is not the least of the reasons that, even in the past, the development of these computers was never completely halted in the Soviet Union. Today, experience on the old large computer series BESM and Elbrus—the

largest Soviet computers—can be drawn upon. Regardless of that, it is hoped that supercomputer development efforts will pay off in the construction of later generations of computers.

The Soviet Union wants to produce circuits and computers which can perform a billion operations/second by 1990. This would approximate the performance of the Western Cray II supercomputer. At the Academy of Sciences Conference, Academy member E. P. Velikhov gave a first accounting of the previous efforts.

In that accounting, various computer prototypes with performance ranging from 60 to 200 million operations/second have been built and tested. Several institutes have experimented with various computer architectures. Work is being done on vector computers and parallel-processor systems based on original (Soviet) VLSI circuitry.

The initiative in the electronics industry has also made its way into the organization. In the past year, a national committee for computer technology and information technology was formed which is supposed to coordinate work in the various ministries. There are currently five ministries working on development and production of computers without mutual coordination.

On one hand, the Academy of Sciences is to again be more strongly involved in development, and on the other hand, inter-departmental institutions have been established in which the development and production of computers are to be pursued. One of the most important institutions is the Academy Institute for Information Technology Problems. They are not only concerned with the development of supercomputers, but also with the construction of personal computers.

### **Western Firms Striving For The Market**

Boris M. Naumov, chief engineer of the Soviet mini-computer series, is the leader of this institute founded in 1983. He is also in charge of the intermediate "Personal Computer" branch group, which was tasked with the development and production of PCs and their software.

Mass production of PCs was still planned for this year. At first, the Agat computer—similar to the Apple II—was anticipated, but because of reliability problems and outdated concepts, the Soviets stopped the project. Series production is to begin now with two new computers, the Korvet and the ES1840.

The Soviet Union wants to produce 1.1 million PCs by the end of 1990. Half of this is to be made available for schools for information technology studies. Naumov estimates the total Soviet need for PCs at about 28 million units. Almost all the major Western PC manufacturers have been pursuing this market for some time

now. The expectations for large orders have hardly been fulfilled, however. The Yamaha company was able to get one order for 4,000 school MSX (sic?: prob MS-DOS) standard PCs.

#### Increasingly Interested In Closer Cooperation

Despite their efforts towards independence, the Soviet Union is still strongly interested in cooperation with the West. In any case, they want to be in the forefront of discussions and decisions on new standards, so as to give the Soviet computer industry the chance to prove itself, to be able to actively participate even in the developmental phase.

The relative strengths of the Soviet computer industry are in computer design and the development of prototypes. They would like to offer this capability to Western firms. In return, acquisition of Western production technology for computer series production is desired, because in the field of industrial production of EDP facilities, the Soviet Union is far behind the West.

In line with that, in Aug 87 Naumov proposed a joint organization which would produce personal computers with Western production technology and Soviet research expertise.

13071

#### Legasov on Priority Directions in Chemistry

18140171 Moscow NTR: PROBLEMY I RESHENIYA  
in Russian No 10, 19 May-1 Jun 87 pp 4-5

[Interview with Academician Valeriy Alekseyevich Legasov, first deputy director of the Institute of Atomic Energy imeni I.V. Kurchatov and chief of the Radiochemistry and Chemical Technology Chair of Moscow State University, by A. Lepikhov under the rubric "The Problem Close Up": "Chemistry. The New Priorities"; date, place, and occasion not given; first two paragraphs are NTR: PROBLEMY I RESHENIYA introduction]

[Text] How is domestic science to be developed?

Academician V.A. Legasov, first deputy director of the Institute of Atomic Energy imeni I.V. Kurchatov and chief of the Radiochemistry and Chemical Technology Chair of Moscow State University, presents his proposals.

#### The Determining Factor

[Question] Valeriy Alekseyevich! I have on several occasions heard your statements on the problems of scientific and technical progress in our country. Each time you have pointed out the major role of chemistry and the inadequate attention to its development. Why does this worry you who work at the Institute of Atomic Energy?

[Answer] In atomic energy, aside from engineering and purely physical, reactor problems, many physical chemical problems exist: the production and processing of nuclear fuel, materials, their stability, the separation of elements, molecules, and isotopes, the conversion of the latter into the chemical forms needed for use, and the use of nuclear energy sources and radiations for technology. There are also many physical chemical problems in other directions of the activity of the institute. This also constitutes the subject of my professional concerns about education, membership in the Physical Chemistry Department of the USSR Academy of Sciences, and scientific duties at the institute. Therefore, my interest in chemistry is natural. Furthermore, you speak with me as the chief of the Radiochemistry and Chemical Technology Chair, and the existing problems of chemical science and the dependence of technology on them can be seen well from here. And quite a few of them have accumulated, moreover, some are still not being worked on.

[Question] But in a recently adopted decree on chemicalization of the national economy to the year 2000 large allocations were earmarked precisely for the solution of technological problems—for the expansion or organization of the production of the same fertilizers, pesticides, reagents, and materials, which today are in short supply. Are there not contradictions here?

[Answer] No. Undoubtedly, the capacities for the production of a number of most important products which we know today will be significantly increased by the end of the century. But the dynamics of the market for chemical products is such that, having increased the capacities for the production of presently scarce materials and reagents, it is possible to have again tomorrow a shortage of products that are being tested today in laboratories. In order for this not to happen, it is necessary to have an advanced scientific reserve and developed domestic technology, which is capable of quickly assimilating what is new and of being easily adapted to market conditions. Moreover, the issued decree practically does not concern the chemical technological problems of those sectors of our national-economic complex, which at first glance do not have a direct bearing on chemistry. But they are extremely important.

As an example I will say that in the fuel cycle of nuclear power engineering not less than 75 percent of performed technological operations are chemical. It is easy to see that progress in the coal and gas industry in the immediate future will involve to a greater and greater degree the use of chemical processes of converting the source raw material into forms most suitable for transportation and use. This also applies to the same, if not to a greater degree to electronics, the production of construction materials, and metallurgy. The following circumstance is also no secret: a new physical or technical idea most frequently retains or loses its appeal in case of practical implementation subject to the quality of materials and the level of technological capabilities which have been prepared by chemists.



In other words, the modernity, the novelty of chemical ideas and practices can be and more and more often proves to be a decisive factor in the development of power engineering, the production of materials and assurance of ecological acceptability and safety of works, that is, the key directions of power engineering of the country. But here in our country it is a long way to things being well.

If you will permit me, let us change roles and I will ask a question.

[Question] Agreed.

[Answer] Do you know how many chemical products are now produced in our country?

[Question] I do not vouch for accuracy, but, it seems, about 100,000 descriptions.

[Answer] A bit less—90,000. So only one-fifth of this vast quantity of chemical products is produced on the basis of detailed scientific developments. I will add that the production technology of more than 90 percent of them has not been optimized. While this inevitably leads to tremendous losses of power, raw materials, and manpower resources, the decrease of product quality and adverse ecological consequences.

Unfortunately, the situation here has not changed for the better with the years: of the roughly 600 new chemical products assimilated each year only one-third are produced according to optimal flow charts.

[Question] And what is the situation with the quality and assortment of our chemical products?

[Answer] A significant portion of them is inferior in quality to the best foreign ones. We have an inadequate assortment of those high-quality products that have a complex of strictly regulated properties. Thus, the world list of especially pure substances and materials comes to about 2,000 descriptions. We produce only 250.

Such a lag is forcing us to import a portion of the modern chemical plants. But they by the moment of start-up, or else when purchased have already had time to become obsolete—no one sells us chemical technologies of tomorrow. In other words, we frequently spend our foreign currency not on overcoming, but on reinforcing technological backwardness.

[Question] You have drawn a sad picture. But one has had occasion to hear not once nor twice: chemists can do anything they wish—it remains merely to overcome the lag of chemical machine building and begin implementing the ideas of Soviet researchers....

[Answer] Indeed, a big gap exists between the scientific support of chemical production and industry. But the perfectly obvious difficulties with the weakness of chemical machine building mask something else—the weakness of all the links of the “basic scientific research-experimental design development-production” chain.

But the rate of our future development and success in overcoming the existing lag is determined—moreover, to an ever increasing degree—by the first and not just by the last link of this chain. The state first of all of basic scientific research in chemistry and not just the problems of chemical machine building require special attention, support, and development.

Attention to Basic Research

[Question] On the basis of what factors do you draw such a conclusion?

[Answer] Let us examine the state of affairs by means of several examples.

Let us start with synthesis—the basis of all chemistry. The efforts being made to attain the world level are concentrated on certain special, important, but not numerous sections. From 10 to 11 percent of the articles in our journals on organic chemistry are devoted to the development of general methods, while in U.S. journals 70-75 percent are. There are fields in which Soviet works amount to less than 1 percent of the world works.

Now concerning chemical dynamics. It investigates space-time changes of chemical systems under the influence of external and internal forces. Precisely here, in the study of general laws of occurrence of processes in case of big gradients (drops) of external fields and temperatures, the phenomena of self-organization, and the peculiarities of the behavior of substances at extra low and superhigh temperatures, lie the foundations of new highly intensive technologies and high-performance chemical reactors with organized structures. Thus, this research, which has been developed extensively in western industrial states, began to develop in the Soviet Union only recently. I will say that the share of Soviet publications on the dynamics of processes in the presence of big motive forces amounts to only 5 percent of foreign publications, while these works themselves in our country do not have the proper resource supply and the necessary attention.

Another field of science, on whose peculiarities I would like to dwell, is solid-state chemistry, in which the theoretical bases of methods of producing modern materials are formulated. The work in this field is dispersed among academic and sectorial institutes and is poorly coordinated, although in the United States, Japan and France special commissions for the study of the trends of development of solid-state chemistry and material science have been set up. Many persons working in this field are engaged in the solution of specific problems, and sometimes simply in the reproduction of what has

already been developed in the world—alas, at a later time and in a smaller volume. The following fact can serve as indirect evidence of the inadequate attention to this trend: in the past 10 years 63 monographs and collections on solid-state chemistry have been published abroad, while only 3 have been published in the USSR.

It is also impossible not to speak about chemical diagnosis—a set of methods of continuous determination of parameters of chemical processes, means of recording changes in properties in case of the conversion of substances, as well as chemical methods of determining parameters of nonchemical processes.

Such methods can speed up basic research, make its results more precise and reliable, and ensure the monitoring of the course of technological processes and the behavior of laboratory and industrial facilities during their operation.

Specialists know well that 60-70 percent of all violations of technology and deviations from standards are due to nothing else but the unsatisfactory quality of means of measurement or their elementary lack. It was calculated a long time ago that the economic impact, which it is possible to obtain if one uses modern methods of continuous monitoring on the basis of chemical microsensing elements (sensors), comes to tens of millions of rubles for the national economy as a whole.

But goal-oriented work both on the development of the theoretical bases of chemical diagnosis and on the devising of practical methods and means of their realization is once again lacking in our country.

And this is occurring at a time when the development of "sensor engineering" is affording a real opportunity for the creation of materials and objects, which "sense" the parameters of a medium and are capable of being adapted to occurring changes. It would seem that we will realize the importance of the rapid development of this branch of chemical science only after the western market is filled with ready-made systems with resolved technological questions.

I will confine myself just to these examples, although their number can be easily increased. It is important merely to stress that the inadequate development of new fields of chemistry, which are emerging before our eyes, is arousing alarm, while the majority of chemists continue to work in established, traditional directions with a high level of previously accomplished achievements. This narrows the possibilities for discovering essentially new phenomena and alternative technologies.

For example, the number of discoveries in chemistry, which have been registered at the USSR State Committee for Inventions and Discoveries, is one-third that in physics given the inverse ratio to the number of researchers and fields of scientific research.

I would like to make immediately a stipulation. We have quite talented highly skilled chemists with a very high scientific potential, but most of them have not been enlisted in the solution of such problems and lack technical means for the implementation of their ideas. And today, if one can so put it, a kind of "shielding" of the creative potential of scientists is taking place—after all, their work is not provided with the necessary material, technical, and organizational conditions.

Collectives of Soviet chemists are also significantly inferior to foreign collectives in the use of effective modern methods of research. In the past 10 years the labor productivity of a chemical scientist in the United States—owing to the use of instrumental methods—has increased by twentyfold, while in our country it has increased by only three- to fourfold.

And another touch to this picture. Modern methods of research yield the biggest impact if they are used in an comprehensive manner. The average "procedural supply" of a scientific publication of an American organic chemist in 1980 came to four methods and that of a Soviet organic chemist came to only two. A somewhat better situation in the 1970's formed in organic chemistry. In 1975 Soviet and American researchers worked here on equal terms, using on the average four methods. After 10 years the procedural supply of our inorganic chemists practically did not change, while that of American organic chemists increased to 6.7. I will add that during this decade the rate of inclusion of new methods into practice was threefold higher in the United States than in the Soviet Union.

I think that the cited examples provide grounds to conclude that the cognitive possibilities of Soviet chemical science due to many years of neglect of its needs are too low relative to the level required today. This can significantly limit its role in scientific and technical progress, if the situation does not change.

[Question] After such a conclusion I cannot but ask you about the reason that led such a situation.

[Answer] You are formulating the question incorrectly. Here there is not one, but an entire set of reasons.

First of all, general chemical academic institutes are equipped markedly worse than, say, physics institutes.

Let us attempt to compare what chemists and physicists have. The latter have the Institute of Theoretical Physics; chemists do not have anything comparable.

There is the Institute of Physical Problems, which is small, but well known throughout the world. This is an actually existing scientific collective with its own traditions and its own buildings. The Institute of Chemical Problems is only the aggregate of several odd laboratories, which rent space in other people's institutions and are not united by a common scientific program.

Chemists do not have anything comparable to the Solid-State Institute, there is also no Institute of Theoretical Problems of Chemical Technology.

To end the analogies I will say that today at the Academy of Sciences for the 30 institutes of the physical mathematical type there are 14 chemistry institutes. And this difference, unfortunately, is not being offset in any way by the activity of chemical sectorial institutes.

The second reason is personnel. There are not enough specialists, who have a command of modern physical chemical concepts, can work with computer equipment, and have advanced training. Their number needs to be increased.

The third is an important reason—the absence in the present structure of scientific institutions of elements which make it possible to reproduce the “technology of research” which has formed in world science.

#### The Technology of Search

[Question] To what is its emergence due and what are its basic traits?

[Answer] The new technology of research originated due to two circumstances—the unprecedented expansion of use of the latest cognitive means and the significant increase of the skills of researchers. And hence an entire chain of consequences. The technical and methodological reequipment of chemistry are leading to a sharp increase in the volume of information that is obtained by one researcher per unit of expenditures. The possibility of rapidly switching from problem to problem is appearing. But such a situation inevitably leads to profound restructuring in the very organization and financing of scientific research and experimental design work and in the system of management and material, technical, and information supply and to the emergence of a new structure of the network of scientific organizations.

Deprived of flexibility and incapable of rapid adaptation and the solution of new problems, the traditional hierarchical structure of scientific organizations, which does not conform to the interdisciplinary character of modern research and development, has died in all the developed western countries. Here they have changed over to matrix structures, while the system of subsidies and contracts, that is, the establishment of scientific collectives for the solution of research problems and their elimination on completion of the work, has become the basic form of the financing of research.

Special centers for the analysis of information, which are equipped with computer hardware and possessing powerful banks of bibliographic and numerical data, have become an indispensable element of the new technology of research. At these centers they track the development of all fields of science and identify the points of growth of new promising directions at the earliest stages of their

emergence. In other words, the personnel of such centers generate new knowledge, processing vast files of experimental knowledge which has been accumulated by all world science. This makes it possible to significantly reduce the amounts of national research through the use of data that has already been obtained by scientists of other countries.

The hardware base of the modern “technology of scientific research” is automated measuring and computing complexes that have computers of the most diverse capacity. The establishment of special measuring centers, which are a national resource, has also become an important form of the “uniting” of researchers with the instrument base. They offer their services to all scientific collectives of the country and often to other states. Thus, for example, 3 years ago U.S. instrument centers annually provided services worth \$1.2 billion. The instruments here are used around the clock, which decrease to one-fourth to one-tenth the cost of measurements and analyses. It is significant that highly skilled processing of the results of measurements and even their interpretation are guaranteed at such centers.

[Question] What do we have today in the field of modern technology of scientific research?

[Answer] Without laying claim to the completeness of the analysis of this most important question, I will say the following.

First of all, the hierarchical structure of scientific institutions in the Soviet Union is basically being retained, while just the first steps (the establishment of temporary scientific collectives) have been taken in the direction of specific forms of research work.

In our country the work, in which special centers for the analysis of information in the West are engaged, is only beginning. Management organs as yet do not have independent, truly objective information on the state of affairs in some fields of chemistry or others.

In the USSR there are also very few measuring centers. Their status so far has not been determined. Along with scientific research institutes, which are supplied well, and in very rare cases excessively, with modern equipment, there are many organizations which do not have even the minimum set of instruments. Such scientific collectives not only do not provide a return, but, consuming a significant share of the assets, actually block and paralyze entire sections of the “scientific” front. Here is the paradox of our development: although most scientific institutions do not have modern scientific equipment, its utilization ratio for the country as a whole nonetheless amounts to 0.3. In other words, even those who have it, use this equipment ineffectively. It is obvious that the system of use of precision instruments, which exists today, came a long time ago into conflict with the basic trends of scientific and technical progress.

The causes of the present lag of our chemistry lie entirely in the administrative management and sociopsychological spheres. After all, there are examples of individual scientific directions, which developed under the same socioeconomic conditions, but did not ensure intensive communication with world science, the rapid assimilation of new cognitive means, and an orientation toward standards of quality, which are dictated by the world level. Developing under the influence of a need for the rapid accomplishment of important state tasks, these directions acquired mobility, as well as developed an entire set of means against conservatism.

#### A Glance at the Future

[Question] In our talk, I believe, it is possible to distinguish two stages. First you described the symptoms of the indisposition, then made a diagnosis. Probably the time has come to move on to the third stage—the prescription of “medicinal remedies.”

[Answer] I believe that it would be absolutely presumptuous on my part to play the role of a “healer.” But as a chemical specialist I cannot but see that the situation that has formed in our chemical science requires the taking of steps on its development:

What could they be? Without predesignating the possible solutions, I will voice an exclusively personal point of view.

I think that it is necessary to begin with the formulation and specification of a list of the new directions, which require special care and determine the new trends in chemical science. After this to approve—by decisions of the USSR Academy of Sciences and the USSR State Committee for Science and Technology—the list of organizations that are taking part in their development, that is, their leaders.

New, presently lacking scientific research centers are needed.

The Institute of Theoretical Problems of Chemical Technology, for example, could become such a center. It is seen as a scientific institution with a minimal staff of permanent staff members and with a scientific board of directors, which includes leading specialists of this field of knowledge (nonstaff without fail!) and performs the role of a kind of jury, which conducts a competitive selection of research programs and deals with the allocation of resources. Researchers should be enlisted in work at this institute solely on the basis of contracts for a period, say, of 3 to 6 years. It will be possible to pose to precisely this institute the most urgent problems of the development of chemical dynamics and flexible chemical works.

An Institute of Fundamental Chemical Problems, also a small scientific institution with respect to the staff, is needed. Highly skilled engineers, technicians, and laboratory workers would be its staff members. Their task is to ensure the operation of basic equipment and all systems for conducting experiments. While Soviet and foreign scientists, who are invited on a competitive basis, could engage in research work at this institute. They should be invited for a period of a half year or more and without fail be given the right of free choice of the directions of research.

A good Institute of Analytical Chemistry—the arbiter in the field of the precision analysis of materials and agents and the developer of new methods of analysis and recommendations on their optimal use—is extremely necessary.

One also cannot do without the increase of the quality of chemical education in the country. Nothing will change, if higher educational institutions are not supplied with reagents, modern scientific and teaching equipment, including, of course, the computer hardware and means of automation of experiments, and their students and graduate students are not afforded the opportunity of field work at the best research laboratories of the country and leading foreign scientific centers.

In speaking of the training of personnel of the highest skills for sectorial science, it should be assigned mainly to the USSR Academy of Sciences and the leading higher educational institutions of the country. The personnel of sectorial science, having gone through the serious school of basic research, will be able to master applied problems more rapidly, while retaining in so doing the opportunity to use information from the front line of scientific search.

And another suggestion. It would be wise to additionally stimulate the development of new promising directions of research, which to a significant degree determine the nature of modern chemical science, having established a statewide resource fund, of which researchers would be the managers and users.

The USSR Academy of Sciences can and should play a decisive role in the further strengthening our chemistry and technology. The increase of the potential of the academy as the main center of basic science is a mandatory condition. Here, of course, the participation of the USSR Academy of Sciences in the solution of applied problems should also increase, not by placing on its shoulders sectorial problems, as frequently happens today, but by creating such an organizational mechanism which would enable the academy to participate more effectively in the expert evaluation of sectorial programs and to influence the formation of temporary scientific collectives, the training and advanced training of personnel, and the information supply of research.

It is necessary to find without fail means of supporting creatively active chemists, who have ideas and the ability to quickly check them, and to help them with equipment. Precisely this will create the necessary prerequisites for activating the entire front of scientific research and development in the field of chemistry and chemical technology and will contribute to a decisive acceleration of scientific and technical progress in the most important sectors of the economy of the country.

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### State System Of Standardization, Reorganization of Economy

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[Article by Chairman of the USSR State Committee for Standards Doctor of Technical Sciences G.D. Kolmogorov under the rubric "Quality Is a Factor of Acceleration": "Standardization Under the Conditions of Reorganization"]

[Text] The January (1987) CPSU Central Committee Plenum once again directed the attention of all the Soviet people to a vital problem facing society—the revolutionary reorganization of all spheres of social life of the country.

General Secretary of the CPSU Central Committee M.S. Gorbachev, who addressed the plenum, gave a detailed description of the strategy of acceleration and of what the party understands by reorganization.

Reorganization is the resolute overcoming of unsolved problems and standstills, which appeared in the national economy of the country at the turn between the 1970's and 1980's, and the development of a reliable and effective mechanism of the acceleration of the socio-economic development of society.

One of the components of reorganization is the increase of the quality of domestic products and the development of high-quality machines, equipment, instruments, and materials, which are competitive on the world market and conform to the highest world achievements. For the saturation of the market with items of a high technical level and quality, which are reliable in operation and use—the end result of the labor of scientists and designers, engineers and workers—is the "main attribute of a robust, flourishing economy."

An Important Stage in the Work on the Increase of Product Quality

In May 1986 the CPSU Central Committee and the USSR Council of Ministers adopted the decree "On Measures on the Radical Increase of Product Quality." An entire set of organizational, economic, and legal

measures, which are aimed at the creation of the necessary change in the assurance of the output of high-quality products, was specified by this decree.

The responsibility of developers and clients for the technical level and quality was increased significantly, organizational levers were specified, and assignments on the increase of the efficiency of the activity on standardization and on the reorganization of organs of technical control were given. Particular attention in the decree is devoted to the human factor—the training, education, and development of the creative initiative of workers and the tightening up of executive discipline.

Nearly a year has passed since the issuing of the decree. In this time state acceptance has been introduced at nearly 1,500 enterprises.

The State Committee for Standards jointly with ministries has significantly sped up the work on the revision of prevailing standards for products for the purpose of establishing in them requirements which conform to the highest world achievements and international standards.

The formulation of standards of the general technical requirements for the most important types of products with long-range indicators, which are "assignments" for designers and process engineers on the development of new promising equipment of the highest world level, should for the most part be carried out in 1987 and be completely finished in 1988.

The programs of integrated standardization, which encompass the most important types of products and the raw materials, materials, components, technological processes, and equipment, which are necessary for the assurance of their quality, have been included as a component in the all-union scientific and technical goal programs, which are approved by the State Committee for Science and Technology and the State Planning Committee and govern the development of technology in the priority directions of the automation and electrification of the national economy.

The demands on the certification of product quality have increased. In the union republics, krais, and oblasts the territorial organs of the State Committee for Standards are carrying out in close contact with party and economic organs work on the implementation of Quality Scientific and Technical Goal Programs.

The scale of state inspection of the observance of standards and specifications and the quality of the output being produced has expanded and its efficiency has increased.

However, the work of state acceptance has shown already this year that many enterprises are continuing the production of obsolete items of low quality and reliability, which do not satisfy the requirements of the standards and specifications and are not competitive on the world market.

A number of enterprises have thus far not taken the steps envisaged by the decree of the CPSU Central Committee and the USSR Council of Ministers on the reinforcement of technical control organs with personnel and their equipment with means of measurement and testing. At many enterprises technological discipline is low, technical specifications have been neglected, and the delivery to related industries of low-quality materials and components is continuing. The still prevailing economic mechanism does not always stimulate the output of high-quality products.

It must be stated frankly that the low indicators, which are established in many standards, do not satisfy the present requirements of the national economy and the needs of the Soviet people. There is no direct connection of standards with production plans, prices, and norms. This will especially make itself felt under the conditions of the changeover of industry, agriculture, and the infrastructure to cost accounting, self-support [samookupayemost], and self-financing, the strengthening of contractual relations, and the broadening of the rights and independence of associations and enterprises. A very important question for us is appearing on the agenda.

What Should the System of State Standardization Become Like Under the Conditions of Reorganization?

The reorganization of the management of the national economy requires, on the one hand, the increase of the influence of state standards on the technical level and quality of products and, on the other, the lifting of unnecessary restrictions in the activity of associations and enterprises. In the draft of the Law "On the State Enterprise (Association)" it is directly stated that the enterprise bears full responsibility for the technical level and quality of the output being produced.

At the same time as this the efficiency of the use of such levers of state quality control as the attestation and certification of products, state tests, state inspection of the introduction and observance of standards, and state product acceptance should be increased significantly.

At present the USSR State Committee for Standards, being the organ of state management, to which the supervision of standardization and metrology in the country, the pursuit of a unified state policy in matters of product quality, as well as the coordination of the activity in this area of ministries and departments have been assigned, is carrying out much work on the reorganization of the state system of standardization under the new conditions of management and on the tightening up of the supervision of the technical level and quality of

products through standards for the purpose of achieving the main thing—the bringing of the quality of domestic products during the 12th Five-Year Plan up to the world level.

The accomplishment of the reorganization of the interaction of central economic organs and ministries in the matter of the planning, norm setting, analysis, control, economic stimulation, pricing, and supply with material and financial resources of the output of products of the world technical level and quality is one of the essential questions of the increase of the efficiency of standardization.

This means that the reliability, productivity, materials-output ratio, power consumption, and other indicators, which are established by standards, should be taken as the basis of the calculations of physical balances and the plans of the distribution of products and should be included in the plans of social and economic development in physical terms together with the quantitative assignments. The supply of the corresponding raw materials, materials, and components of the necessary quality should be carried out through the plans of distribution.

The standards should become an infeasible law of production and, in the future, an assignment on the level of the demands on new equipment and the basis for the formulation of norms and standards of the consumption and distribution of resources, as well as the establishment of the level of prices.

Work has already been started in many directions of reorganization in the area of standardization, metrology, and product quality.

#### The Improvement of the Collection of Standards

The first task, which the State Committee for Standards began working on at the beginning of the current five-year plan, is the improvement of the collection of prevailing standards.

The intensive growth of the number of standards and the amount of information contained in them in past years increased extremely, and the need for some reduction and optimization of it arose.

This work is being performed in various directions. Thus, the replacement of a number of standards by one standard for a group of similar products of the general specifications (OTT's) type with long-range indicators, which ensure the output of items which correspond to the world level, is envisaged by the plan for the 12th Five-Year Plan.

By the end of 1988 it is envisaged to formulate and approve about 500 standards of technical specifications for all groups of similar products for the sectors of machine building. However, this is only the first part of the accomplishment of the task. The second, no less

important part is the bringing of sectorial standards and specifications, in accordance with which a specific product will be produced, in line with the requirements of the standards of general specifications.

In 1987 it is envisaged by the plan of state standardization to bring up to the world level about 21 percent of the prevailing collection of state standards, which establish the technical demands on products. Thus, with allowance made for similar work, which was performed last year, by the end of 1987 about 40 percent of the state standards for products will correspond to the best world achievements.

The planning of standardization by the formulation of comprehensive programs is the only effective method, which makes it possible to systematize and to make visible the entire set of standards, which ensure the quality of the final item with allowance made for the diverse requirements of the consumer and the restrictions, which are imposed by the availability of resources, the state of the production base, and so forth. The five-year plan calls for the formulation of 41 programs of comprehensive standardization, of them 21 are on machine building and 10 are on the improvement of the quality of consumer goods.

It is necessary to eliminate as soon as possible the main shortcoming of the past, when the sectors, which are the suppliers of materials and components, in the process of coordinating and implementing programs gradually emasculated them and lowered the demands which had been incorporated by the main developers in the standards for the final product.

The decree "On Measures on the Radical Increase of Product Quality" gives the right of dictation to the developer of new equipment, while this clears the way to the development of truly goal and really comprehensive programs which are clearly tied to the end result.

The reorganization presently under way and the improvement of the economic mechanism, the significant broadening of the rights and responsibility of ministries, associations, and enterprises, the policy of the acceleration of scientific and technical progress, and the utmost development of the initiative and creativity of collectives of workers, the scientific and technical community, managers, and specialists revealed the objective need for some streamlining and further improvement of the prevailing organizational procedural and general technical sets of standards for the purpose of reducing the "paper barriers" in the way of the introduction of new equipment.

The most important direction of the improvement of these sets was the simplification of their requirements and provisions, as well as the specification of the optimum composition.

As a result of the work performed in 1986 on the optimization of the collection of organizational procedural standards it was deemed expedient to reduce their number: of the 36 prevailing intersectorial systems 15 were abolished, 168 state standards were abolished, 285 were revised and changes were made in them, 70 state standards were converted to sectorial documents and working documents.

The USSR State Committee for Standards was forced to abolish practically all the sectorial standards, which establish their own procedures of the coordination of documents, which increase labor expenditures in an entirely unfounded manner by the performance of various routine operations.

The changes of such sets of standards as the System of the Development and Delivery of Products to Production, the Unified System of Design Documentation, the Unified System of Technological Documentation, and the Unified System of the Technological Preparation of Production substantially simplified the procedure of the drawing up, coordination, and approval of design and technological documents and the delivery of items to production. As a result more than 50 percent of the time of designers and process engineers was freed for creative work and the time of the drawing up of documents was shortened.

However, as the check showed, the implementation of already made decisions on the streamlining of the processes of drawing up documents and their delivery to developers are being carried out extremely slowly in the sectors of industry. It is necessary to organize the direct information of workers of design and technological organizations about the decisions being made and to speed up thereby the process of developing and assimilating new equipment.

In this matter the State Committee for Standards is placing great hopes in the Council of Chief Designers attached to the USSR State Committee for Standards, which was established in accordance with a decision of the Bureau of the USSR Council of Ministers for Machine Building.

In the work on the further improvement of the general technical and organizational procedural sets of standards and programs of standardization attention should first of all be directed to the development and improvement of systems and programs, which ensure the acceleration of scientific and technical progress. This applies first of all to the system of the development and delivery of products to production, the computer-aided design system, and programs of the standardization of automated flexible production systems, robotic complexes, computer technology, and information science.

The reform of the state system of standardization in order to ensure under the new conditions of management the efficient interaction of all levels of management

in the achievement of the ultimate goal—the output of products of the world technical level and quality—will become the central task of the 12th Five-Year Plan.

Taking into account that in the future sectorial standards should be formulated only for a product and only in the absence of state standards for it, it is necessary that the ministries would specify the composition of the standards for the sector, proceeding from the specific nature of production and guided by the long-range indicators of state standards for groups of similar products. It is necessary to devote serious attention in sectorial standardization to the questions of unification, the introduction of modular designs, and the requirements for operation (including repair) and to the establishment of advanced methods and means of testing and checking products.

The organization and procedure of the formulation of standards require serious revision, in addition the extensive introduction of the formulation of standards by working groups of skilled specialists of the producers and users of products and personnel of scientific research institutes and the higher school, which has justified itself in practice, is necessary.

#### On the Improvement of the Most Important Elements of State Product Quality Control

As was already noted above, the changeover to the use of primarily economic methods of production management on the basis of full cost accounting is responsible for the urgent need for the further development and improvement of such important elements of state product quality control as certification and state tests, state acceptance, and state inspection.

And, indeed, under the new conditions of management the increase of the output of products of the highest quality category and the obtaining of the corresponding wholesale price markups are becoming the most important means of increasing the profit (revenue) of the enterprise and one of the important sources of self-financing. At the same time for the output of products of the first quality category and obsolete items, as well as poor-quality products the enterprise should be punished by wholesale price reductions and should incur material liability and inevitable losses in the cost accounting income of the collective, the wage, and social benefits. Therefore, the certification of products in accordance with two quality categories, on the results of which the obtaining of markups or reductions on the wholesale price of the items being produced depends, is becoming a very effective tool of the systematic increase of product quality.

For the elimination of the existing shortcomings in the practice of state certification of industrial products it is necessary to increase substantially the responsibility of state certification commissions for the objectivity of the decisions being made. The State Emblem of Quality

should be applied only to the product, which in its technical and economic indicators (reliability, productivity, materials-output and power-output ratios, labor safety, ecological indicators, and industrial design) surpasses the level of world achievements or corresponds to it and, undoubtedly, is competitive on the foreign market.

Only such a product, the quality of which is constantly guaranteed by high standards of production and the strict observance of technological discipline, can have the State Emblem of Quality.

The further development and improvement of state tests are one of the important directions of the increase of the objectivity of certification and the assurance of the efficiency of the entire system of product quality control. A base for experimental operations and tests, which makes it possible to ensure: the comprehensive evaluation of the most important parameters of the product, including reliability, especially at the stage of its development, up to placement in production and industrial use; the careful acceptance and periodic checking of the finished product during its production, as well as the objective evaluation of the technical level and quality of the product during attestation and certification, should be established in the sectors of industry.

For the effective solution of this problem it is necessary in the next few years:

- to develop a standard base and first of all to provide with the optimum plans of checking and with programs all the most important categories of check tests, first of all of products which are liable to state acceptance;
- to ensure the production of modern testing equipment, which is developed on the basis of standardized modules (blocks), which make it possible to assemble specialized test stands and units;
- to organize the efficient use of single-design test stands and testing grounds on an intersectorial basis;
- to increase the efficiency of the work of the main organizations for state tests and testing centers in ministries and departments, to accomplish on their basis the stage-by-stage formation of a network of independent state testing centers of the USSR State Committee for Standards, and to ensure the conducting at them of acceptance tests of all new equipment, certification tests, as well as tests for attestation.

The effectiveness of metrological activity in the country and the creation of the conditions for the leading development of standards and the radical improvement of the system of the transfer of the sizes of units to all operating means of measurement are of substantial importance in solving the problems of the radical increase of product quality. More advanced standard aids are also needed.



The influence of state tests of instruments on the technical level of the measuring equipment being produced by industry should be increased significantly.

The world level of used means of measurement is an indispensable condition of the assurance of high product quality.

Of course, such a new type of activity for us as state acceptance merits special attention.

Little time has yet passed since the day of its introduction, but it is safe to say that it has already played a positive role in the reorganization of the work on increasing product quality. Thus, tendencies for the efficiency of the work of technical control services at enterprises and associations to increase have emerged, production and technological discipline is being tightened up, the quality of the manufacturing of products is improving, to which the increase of the volumes of products, which are accepted by state acceptance on first presentation, attests.

The first results of the work of state acceptance showed that more than half of the enterprises are steadily turning over their products in conformity with the established requirements. Approximately 25 percent of the enterprises are producing products with deviations from the technology and the requirements of design documents. However, here it is possible in a short time to put things in the necessary order. The remainder of the enterprises need substantial assistance on the part of ministries, departments, and local organs of management: in the reequipping of production, the replacement of obsolete equipment, the development of advanced means of checking and testing, and the increase of the skills of personnel.

For the purpose of the strengthening, the further development, and the improvement of the work of organs of state acceptance at enterprises and associations the USSR State Committee for Standards needs to carry out in a short time much very important work, the basic directions of which are:

- the formation and development of a system of management of the activity of organs of state acceptance;

- the procedural and standard support of the effective fulfillment of all the tasks and functions, which have been assigned to state acceptance;

- the organizational procedural support and practical development of the efficient interaction of state acceptances and territorial organs of state inspection.

Here it is necessary to proceed from the fact that state acceptance is not simply an additional control organ, but a competent organizer of the prompt identification and

elimination of what are called "bottlenecks" in the design of items, the technology of their manufacture, and the organization of production.

It should be noted that the establishment of state acceptance in no way belittled the significance of such a developed and quite well-organized service as state inspection. Indeed, with the introduction of state acceptance state inspection of standards and means of measurement should acquire a fundamentally new quality, which would make it possible to increase radically its effectiveness and efficiency.

The constant analysis of the work of associations, enterprises, and organizations on the increase of product quality; the analysis of the state of affairs with the technical level and quality of products in regions, cities, oblasts, krays, and union republics are an essentially new element of the work of the organs of state inspection.

In 1987 data banks on the technical level and quality of the most important products being produced in the region should be created at all centers of standardization and metrology and laboratories of state inspection of standards and measuring equipment. As a result the organs of state inspection will become the only holders of generalized information of such a sort, which not only will increase substantially their importance in the tightening up of state discipline, but will also change fundamentally the role of the State Committee for Standards in the entire mechanism of product quality control.

The data banks from all regions, which have been integrated on the basis of electronic equipment at the Main Computer Center of the USSR State Committee for Standards, should become an important unit of the information support of the management of scientific and technical progress on the scale of the entire union.

Addressing the January (1987) CPSU Central Committee Plenum, M.S. Gorbachev said: "Not everyone has understood that to work in the new way means to give up resolutely old habits and methods. But this, in the end, depends on the civic position of each person, on a conscientious attitude toward the assigned job and toward one's duties, for which we are all responsible to the party, to the country, and to our own conscience."

In now reforming many established forms of work in the area of standardization and quality control, we cannot but note that a number of negative phenomena, which have been noted here and were known earlier, first of all depend on those who performed and are performing this work. Conservatism and formalism, which are characteristic of many standardizers, and the aspiration to regulate every step of the developer and production worker have as a consequence the increase of the number of documents in systems and sets of organizational

procedural standards, the inadequate skill of developers has as a consequence the vagueness of many formulations, which complicate the fulfillment of the requirements of standards.

The aspiration to protect departmental interests has gotten in the way of the formulation of many advanced standards and especially programs of comprehensive standardization, in which practically every step has come up against (and continues to come up against) the reluctance to take into consideration one's production partner.

As the first results of the work of state acceptance show, it is most difficult of all to fight against the overcoming of the habit to place quality in the background, which for years has been ingrained in the consciousness of people.

Of course, the question of the change of consciousness cannot be settled by orders and instructions alone—painstaking, systematic, persistent work at all levels is needed.

But it is a matter not of the change of consciousness alone. Labor, technological, and state discipline is of decisive importance in the work on the assurance of high product quality. Order should be order, and it is impossible to conceal with any well drawn up documents the harm done by deviations from the norms and regulations.

The level of skills both of specialists, who are engaged directly in the production of output, and of standardizers, metrologists, inspectors, and everyone, who organizes product quality control, also plays a most important role.

In each sector and region a permanent system of instruction, not an abstract one, but one that has been adjusted to the specific conditions of the given organization, division, shop, section, and brigade, is necessary for this.

A competent, skilled, well-trained specialist can display both great independence and a more conscious approach to the establishment and strict observation of norms and regulations in the process of his labor activity.

Thus, as was stated in the decree of the January (1987) CPSU Central Committee Plenum, it is necessary "for every communist and every citizen to feel disposed to long, intense, dedicated work. This is the only correct party approach. The guarantee of the success of reorganization lies in the efficient, conscientious work of everyone without exception."

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### **Control Of Quality Of Final Product**

*18140163c Moscow STANDARTY I KACHESTVO in Russian No 4, Apr 87 pp 52-56*

[Article by Candidate of Economic Sciences V.G. Versan, deputy director of the All-Union Scientific Research Institute of Standardization, under the rubric "Quality Control": "Problems of the Organization of the Comprehensive Control of the Quality of the Final Product"]

[Text] At present the resolution of the contradiction between the need, on the one hand, to ensure the further strengthening of the centralized elements in the management of the economy and, on the other, to broaden the economic independence of enterprises and organizations is one of the basic problems of the reform of the economic mechanism. The great reserves for the increase of the efficiency of the management of the national economy have not been used to a considerable extent precisely due to the fact that effective forms and methods of overcoming this contradiction were not found in good time.

As applied to product quality control the solution of the problem in question implies the need both for the assurance of the irreproachable implementation of a unified state policy in the area of the rate of updating and the increase of the technical level of items and for the creation of favorable socioeconomic, organizational, and technical conditions for the increase of the creative activity of developers and producers of new high-quality and competitive products.

To this it should be added that the necessary radical acceleration of the rate of updating of products requires both the intensification of the activity of the enterprises and organizations, which are participating in their development, production, and use, and the improvement of their interaction, that is, the intensification of the work at the meeting points between them.

The introduction of full cost accounting, which encompasses all related industries, and the establishment at the state level of precise criteria of the evaluation and economic stimulation of each of them for the contribution to the achievement of a high end result are necessary for the coordination of the economic interests of related enterprises and organizations with state interests under the conditions of self-financing.

Here such cardinal steps as the introduction of the state acceptance of products and the requirement of the 100-percent observance of contracts have been taken to put a stop to an antistate practice, which finds expression in the violation of the requirements of standards, the output of products, which are not in demand, and the upsetting of contractual obligations.

At various stages of the life cycle of products it is possible to distinguish such nodal moments (let us call them "nodes"), on which the technical level and quality of final items, as well as the time of their development depend decisively. Such "nodes" are: the approval of the state standards of the general technical requirements for groups of similar products and the technical assignments for the development of products; the conducting of acceptance tests of the prototype; the making of a decision on placement into production; certification; the making of a decision on the shipment of products to the user. Conflict situations between developers, producers, and users arise precisely at these "nodes" due to the

difference of their interests, which appears when settling the questions of the technical and economic indicators of the products being developed, the quality and stability of their production, the time of development, and others.

Practical experience shows that the decisions made at these "nodes" are often poorly coordinated both with each other and with state interests in the matter of developing in the shortest possible time a final product which conforms to the world level. Thus, when formulating the requirements in a number of cases the real state or proposed change of the production base is not taken into account in the technical assignments. This has the result that either the established indicators are not ensured or the time of the assimilation of the product by production increases. As experience shows, the product developers' lack of a genuine economic interest in the making of advanced decisions is one of the causes of such a situation.

The procedure of work at the named "nodes" is established by various enforceable enactments and decrees of directive organs. Work is now being performed on the rationalization and simplification of this procedure. Thus, at present the USSR State Committee for Standards is performing work on the improvement of the System of the Development and Delivery of Products to Production (SRPP) and other sets of standards. This work is having a positive effect on the increase of the technical level and quality of products and the shortening of the time of their development. At the same time, experience shows that even the most detailed analysis of organizational and procedural questions in enforceable enactments will not radically improve the formed situation.

And, indeed, there is no and can be no single formula for the best resolution of situations which arise under real conditions. In the decision making process one has to take into account a large number of contradictory factors, which are due to the specific nature of production and the product, and to surmount departmental barriers. Therefore, the human factor, that is, the interest of people, their creative activity and initiative, which in principle do not lend themselves to regulation and to a significant degree depend upon the effectiveness of moral and material stimulation, is of decisive importance for the making of the optimum decisions.

Today all these negative phenomena are appearing most vividly in the process of formulating and implementing the Quality Programs, since constant work has to be performed on the establishment and maintenance of horizontal relations between related organizations and enterprises and the causes of arising irregularities have to be analyzed and eliminated.

A number of important steps on the rapid development of products, which conform to the world level, are envisaged by the decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on

the Radical Increase of Product Quality" and the decree of the USSR Council of Ministers "On the Improvement of the Procedure of the Formulation and Coordination of Technical Specifications in Case of the Development and Delivery to Production of New (Modernized) Products of Machine Building." The majority of them are aimed at the assurance of the coordinated work of all related organizations and enterprises regardless of their departmental affiliation for the output of a high-quality final product. The necessary conditions for the increase of the efficiency of product quality control have thereby been created today.

At present, when the increased scale of production and the complication of sectorial and intersectorial relations have dictated the necessity of the integration of science, production, and operation, as well as the concentration of resources on the achievement of high end results, the formation of a mechanism, which ensures the comprehensive control of the processes of the creation of the final product in accordance with the criterion of the achievement of the world level and its effective use in operation, is the most urgent direction of the improvement of product quality control. This mechanism should regulate the interrelations between enterprises and organizations at those "nodes," which were spoken about above, and ensure the concerted action at them of developers, producers, and users.

In this mechanism the product should be the object of control. Only in this case can specific goals in the area of quality be formulated and can coordinated steps on the increase of the scientific, organizational, and technical potential of enterprises and organizations, which is necessary for the achievement of the set goals, also be specified. Moreover, only in this case can genuine cost accounting relations between partners be organized.

The fact that given such an approach it seems possible on an objective basis to improve the organizational relations between enterprises and organizations, including to form interbranch scientific technical complexes (MNTK's), scientific production associations (NPO's), and other advanced organizational forms of the integration of science and production, is also a very important circumstance.

Let us examine the basic assumptions with respect to the composition and structure of the comprehensive mechanism of product quality control.

1. Control should be organized at two levels: control of a group of similar products; control of a specific type of product.
2. The coverage by control of the entire life cycle of the product should be ensured at each of these levels.

There should become the heart of the mechanism when controlling the quality of a specific product the scientific and technical goal program of the increase of quality and reliability, which includes:

—assignments on the bringing of specific indicators (the reliability, purpose, materials-output ratio, and others) up to a level, which will exceed world achievements during the entire period of series production, of course, with allowance made for the time of the development (modernization) and assimilation of the product;

—measures which ensure the fulfillment of assignments at all stages of the life cycle of the product.

The measures should envisage: the introduction of advanced means and methods of computer-aided design; the establishment of information systems for the supply of developers with the necessary scientific and technical information; the development of the pilot experimental base of research and design; the modernization and retooling of production on the basis of the use of advanced technological processes and equipment and advanced forms of the organization of production and labor; the introduction of advanced methods of the statistical regulation of technological processes and built-in means of technical diagnosis and nondestructive testing; the establishment of special-purpose creative multiple-skill brigades and the improvement of the material stimulation of developers and producers for the quality and the shortening of the time of the development and assimilation of new items; the training and the increase of the skills of personnel.

Other measures, which are necessary for the achievement of the goals of the program, should also be formulated. Here it is advisable to proceed from the results of the certification of workplaces, technological processes, and the organizational and technical level of production as a whole.

For the shortening of the time of the development and assimilation of a product in production the program should provide for the simultaneous performance of work on designing and the technological preparation of production.

The formulation and implementation of the program should be carried out under the supervision of the general (chief) designer of the final product. For the assurance of the development of the product at the world level he should establish the necessary demands on the developers of semifinished products and components, evaluate the quality of fulfillment of the stages and assignments of the program, as well as stimulate their performers economically and materially. Therefore, he should have the opportunity to carry out the financing of work on the program and to redistribute special-purpose material and technical resources.

In case of the organization of the quality control of a group of similar products it is necessary to envisage the formulation of a special program, which should be implemented in the process of conducting scientific research for the formulation of a state standard of general technical requirements. It should ensure the achievement of the values of the basic indicators of the technical level of the product, which are established by this standard.

3. A coordinating organ, the task of which is the pursuit of a unified technology policy in the process of developing and using a product, should become the central unit of the mechanism.

Such organs should be formed with allowance made for the specific nature of the sectors or sets of interconnected sectors. The rights of these organizations, which enable them to carry out at the distinguished "nodes," which were spoken about above, the constant monitoring, evaluation, and regulation of the results of the activity of enterprises and organizations of different departmental affiliation in accordance with the criterion of the conformity of the product to the world level during the entire period of its series production, should be established by directive organs.

Today machine building is most prepared for the formation of such organs. Interbranch scientific technical centers and the main organizations for the type of product or the main developers respectively can act as the coordinating organ at each level of management, which was noted above. The activity of the Rotor Interbranch Scientific Technical Complex, which is the main organization in the country for rotary automatic lines, and of the main organizations in ministries for their individual types can serve as an example of the practicability and advisability of such a structure of coordinating organs.

4. The state standards of the general technical requirements for groups of similar products, the standards for products, the sets of general technical and organizational procedural standards, and the state inspection, state acceptance, certification, and state tests of products should constitute the standard technical and organizational basis of the comprehensive mechanism.

In this connection the question of increasing the efficiency of the action of sets of general technical and organizational procedural standards is extremely urgent. They should, on the one hand, provide enterprises (organizations) with the maximum opportunity for the making of decisions on internal questions of organizational, technology, and economic policy and, on the other, ensure the efficient organization of the interaction of the parties at the above-named "nodes." Precisely these criteria should also become the basis for their revision.

A fundamental question, on the settlement of which the quality of the final item depends to a significant degree, is the practical implementation of the provision of the decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Radical Increase of Product Quality" on the granting to the developer of the final product of the right to establish assignments, which are mandatory for the developer of materials and components, on their technical level and quality.

It seems advisable for these purposes to establish in the standards and specifications coordinated demands on the final item and on the most important parameters of the materials and components, which are used in it. The formulation of such standard technical specifications requires the close interaction of all the developers, beginning already at the earliest stages of the development of the product, the fundamental merging of the processes of designing, and the standardization of the demands on the product.

From this standpoint the use of joint organizational procedural standards of enterprises (organizations), which are approved by the manager of the organization that is the developer of the final product in consultation with related industries, is of great practical interest. Such standards can, for example, establish the procedure of the coordination of the demands on the product being developed, the organization of designer's supervision, the monitoring of the fulfillment of the assignments of the scientific and technical goal program of the increase of quality, and the organization of the gathering of information on the quality of a product in the process of its use.

From the standpoint of the requirements of the mechanism in question a special role in the orientation of the activity of related enterprises toward the achievement of a high end result belongs today to state product acceptance. Precisely it is called upon to settle the main question, without which the economic organism cannot operate normally—to cut off access to the consumer for low-quality products, which do not satisfy the requirements of the standards and specifications. Here it does not simply erect a barrier to defective output, but performs active work on the analysis and elimination of the causes of its appearance, influences the suppliers of poor-quality components, and gives assistance to the enterprise in the radical improvement of product quality.

5. The comprehensive mechanism of quality control should envisage an individualized approach to the organization of control, based on the fact that the participants in the process of developing and using a product can have a different organizational structure (the enterprise, scientific research institute, design bureau, scientific production association, and so on).

6. Directly at enterprises and organizations the system of quality control should be formed on the basis of the combination of goal program and functional management, cost accounting, and self-financing.

The organization of goal program management should ensure the fulfillment of the assignments of the scientific and technical goal programs of the increase of quality and reliability, which are formulated within the comprehensive mechanism. Here the coordinated work of the entire chain from the designer to the worker should be ensured, while the functional approach will establish the tasks of subdivisions and performers.

There should be created at enterprises the conditions for the assurance of the stable output of products in conformity with the requirements of the standard technical specifications, which envisage in addition:

- the availability at each workplace of a complete set of planning and design and technological documents and standard technical specifications;

- the technological preparation of production, which ensures the required precision of the fulfillment of technological operations, as well as the production of parts, assemblies, and items as a whole;

- the increase of the efficiency of incoming, operational, and acceptance inspection on the basis of the introduction of advanced methods of the statistical control of product quality. The organization of incoming inspection should ensure the complete elimination of the possibility of the use in production of poor-quality raw materials, materials, semifinished products, and components;

- the close business cooperation of the technical services and, in particular, the technical control services of the manufacturing enterprises with the corresponding services of the supply enterprises;

- the creation of the conditions for the efficient work of state acceptance organs and the taking of prompt steps on the elimination of the shortcomings identified by them;

- the establishment of a system of the gathering of information on the behavior of a product in the process of its use or consumption, the recording and analysis of claims and complaints, as well as the remarks of services of departmental control, state acceptance organs, and territorial organs of the USSR State Committee for Standards.

The work on the analysis of the causes of product defects, which have been identified in the process of production and use, should be improved substantially and their prompt elimination and prevention should be organized. In each case of the identification of a defect the causes of its occurrence and the guilty parties should

be established, while the most effective means of its elimination and prevention should also be specified. For this purpose it is advisable at the enterprise to develop a classifier of the types of defects, the possible causes of their occurrence, and the methods of elimination.<sup>1</sup>

The work under the conditions of self-financing requires the economic substantiation of the decisions being made on the basis of the study, consideration, and generalization of the data on the effect of product defects on the technical and economic indicators of the enterprise.

For the purpose of increasing the creative activity of workers it is necessary to establish groups of quality in shops and sections. Their activity should first of all be aimed at the elimination of the causes of defects, as well as the shortcomings, which were identified during the certification of workplaces, technological processes, and the organizational and technical level of production. For this it is necessary to select skilled and resourceful managers, to carry out the systematic instruction of the members of the groups of quality, to use various forms of the material and moral stimulation of their active members, as well as to promote widely the importance and significance of this work.

The necessary changes should be made in the enterprise standards of the system of product quality control, bearing in mind that the activity, which they regulate,

should ensure: the accomplishment of the assignments of the goal programs and the objective evaluation of the contribution of each subdivision and performer to their effective stimulation; the establishment and the organization of the creative work of groups of quality; the interconnection in the work of the subdivisions of the enterprise and state acceptance; the successful fulfillment of other measures, which are aimed at the radical increase of product quality.

In conclusion it should be noted that the foregoing urgent questions of the development of a comprehensive mechanism of the control of individual types and groups of similar products should be studied with allowance made for the requirements of the USSR Law on the Socialist Enterprise (Association), which is presently being discussed, as well as the work being performed on the specification of the functions of central organs, ministries, and departments.

#### FOOTNOTE

1. See "Zero-Defect Technology," STANDARTY I KACHESTVO, Nos 5, 6, 1986.

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**Kriotekhnika All-Union Scientific Production Association**

*18140161a Moscow SOVETSKAYA ROSSIYA in Russian 29 Apr 87 p 2*

[Interview with Vladimir Yegorovich Kurtashin, general director of the Kriotekhnika All-Union Scientific Production Association, by V. Shilov: "On the Paths of Yesterday's Instructions. Why the Rules of Cost Accounting Did Not Affect the Developers of New Equipment"; date, place, and occasion not given; first paragraph is SOVETSKAYA ROSSIYA introduction; last paragraph is SOVETSKAYA ROSSIYA conclusion]

[Text] A year ago on the initiative of Corresponding Member of the USSR Academy of Sciences and Hero of Socialist Labor V.P. Belyakov the All-Union Scientific Production Association for Cryogenic Equipment was formed. It includes 5 scientific research institutes and 15 machine building plants. Ideally, the Kriotekhnika All-Union Scientific Production Association is responsible not only for the scientific and technical level of its equipment, but also for the complete meeting of the needs for it of all sectors of the national economy. Today V. Kurtashin is in charge of this large scientific machine building complex.

[Question] Vladimir Yegorovich, until recently you were the chief of one of the main administrations of the Ministry of Chemical and Petroleum Machine Building and essentially managed the same subsector. How does your present position differ from the previous one?

[Answer] I consider myself a student and follower of Viktor Petrovich Belyakov, a great scientist and remarkable economic manager. Who, if not we, his allies, is to embody the jointly nurtured ideas and thoughts? I am convinced that the All-Union Scientific Production Association is precisely the formulation of integration "science-technology-production," which we need to actually convert science into an immediate productive force. For example, our Balashikha Kriogenmash Scientific Production Association accelerated the rate of development of the most modern equipment by two- to threefold. Production volumes increased by threefold. The lack of capacities for increasing the production of the equipment developed by us began to be felt noticeably. The development of the scientific production association into a scientific machine building complex is making it possible to extend the experience of Kriogenmash to the practical work of the most important industrial subsector. The changeover to the new conditions of management and full cost accounting with self-support [samookupayemost] and self-financing in contrast to the paperwork of the main administration affords great opportunities for active, productive work.

[Question] What has it already been possible to achieve during the year of the activity of the Kriotekhnika All-Union Scientific Production Association?

[Answer] First of all the management system was formed. The so-called comprehensive functions of the management not only of the main association, but also of all the complex's enterprises were assigned to the managers of the Kriogenmash Scientific Production Association. Thus, the All-Union Scientific Production Association has assumed many important duties of the ministry, having eliminated the intermediate level, the main administration, from the management system. What is interesting is that the "loss" of the main administration did not affect the quality of the work of the subsector. Under the conditions of the two-level management system the All-Union Scientific Production Association last year and now is successfully coping with the scientific, technical, and production assignments.

[Question] Hence, have all obstacles in the way of scientific and technical acceleration in the area of cryogenic equipment been eliminated?

[Answer] Unfortunately, no. The process of integration within the framework of the successful structure of the All-Union Scientific Production Association time and again runs into the barricades of conservatism and bureaucratism. Note the following fact. Several completely foreign enterprises were mechanically included in the system of the cryogenic sector—these are the plants of round billets, geological exploration equipment, and compressor and autogenous equipment. In themselves the enterprises are small. The management of the Ministry of Chemical and Petroleum Machine Building thinks that such a "makeweight" will not be a burden on us. But these five nonspecialized plants are turning the All-Union Scientific Production Association into a sort of multisectorial conglomerate. Can, for example, cryogenic specialists manage the production of round billets or geological exploration equipment sufficiently competently, at a high scientific and technical level? It is more logical to attach refrigeration machine building to cryogenic machine building. But, evidently, in this case the ministry was trying to make things more convenient for the structure, and not better for work.

[Question] I remember, Vladimir Yegorovich, that your predecessor V.P. Belyakov frequently brought up the issue of the need for a radical change in the system for planning the activity of scientific production associations. The point was that the USSR State Committee for Science and Technology approves and looks after scientific and technical tasks, while USSR Gosplan establishes the production targets. The collective of the scientific production association ends up in the position of a man straddling two stools...

[Answer] ...And the "Gosplan stool" is far more comfortable. For instance, for the fulfillment of plan assignments the plant collectives receive bonuses in the amount of 35 percent of the wage, and personnel of institutes receive only 22 percent. This obvious injustice regarding science has not been eliminated even to this day. Debates are always occurring: Is it possible to

consider scientific developments as commodity production? The changeover to the new conditions of management intensified even more the contradiction between science and production. Production is already living by the rules of cost accounting, but scientific developments are still being planned according to old methods, which categorically forewarn: do not dare exceed the wage fund established for science (and, hence, also the amount of scientific and technical development). As a manager of cost accounting production I can vary the plant's wage fund, yet as the director of an institute I am lack such an opportunity.

[Question] How can this be? The new methods of management on the basis of full cost accounting are called upon to provide priority conditions for the development and production of the most advanced machines....

[Answer] On the basis of the experience of our collective, and it, I think, is typical of all scientific production associations, I should directly state: the new economic mechanism in practice does not give economic advantages to the developers of scientific and technical innovations. As of this year the Kriotehnika All-Union Association has changed over to the conditions of self-support [samookupayemost] and self-financing. Thus, plants with series production have acquired the right to deduct 10-11 kopecks per ruble of profit earned for their material incentives fund, yet the Kriogenmash Scientific Production Association can deduct only half as much. The fact is that the USSR State Committee on Prices determines the prices for new items essentially according to the same rules as for series-produced products. Associations producing new equipment, which requires large labor expenditures, virtually cannot fulfill assignments on the profit. While this leads to a decrease in economic stimulation funds. How can such biases be overcome? Our request is extremely simple: allow part of the assets from the fund for the development of production, science, and technology to be transferred into the material incentives fund for the stimulation of the development of new equipment, without reducing in all in so doing the deductions for the budget and the contributions for sectorwide needs. Even the name itself—the fund for the development of production, science, and technology—suggests the possibility of using it to stimulate the developers of new equipment.

The commission of USSR Gosplan, which under the chairmanship of Yu.M. Andronov, chief of the Chemical and Petroleum Machine Building Department, checked the readiness of the Kriotehnika All-Union Scientific Production Association for the changeover to self-financing, recognized our arguments to be reasonable. With its aid we succeeded in getting a settlement of the issue at the level of First Deputy Chairman of USSR Gosplan S.A. Sitaryan. We obtained the right for the Kriogenmash Scientific Production Association to deduct 8.5 kopecks per ruble of profit for the material incentive fund over the entire five-year plan. But this, let us note, is an exception and is for only 4 years. The

conclusion suggests itself that the procedural provisions on the conversion of associations to full cost accounting, which are in effect today, do not ensure a genuine interest in the development and production of new equipment.

The economic retardation in case of the production of new equipment in accordance with single and one-time orders is particularly strong. Here the enterprise does not have an opportunity to gradually reduce the expenditures on its production, because the results of developments of scientists, designers, and process engineers take shape at the stage of development and manufacturing. All subsequent design innovations will be included in new models of the items. On the order of the Institute of Atomic Energy imeni I.V. Kurchatov we developed a unique cryogenic support system for the Tokamak-15 thermonuclear installation. The new version is noted for increased reliability, the length of the working cycle was increased by 2.5-fold, and the specific expenditures per unit of the effective impact were reduced by 15 percent. The client, by using this system, annually derives an economic impact of more than 1.5 million rubles. A cryogenic complex for an elementary particle research installation was developed for one of the academic institutes. Instead of the previously used cryogenic tanks a design, which makes it possible to use liquid nitrogen, which is one-twentieth as expensive as argon, was used. The client saves over 100,000 rubles annually on this alone. While, for the most part, the developers of this remarkable equipment are left only with moral satisfaction.

It is necessary, we think, to increase the influence of scientific and technical progressiveness on the value of the standard of deductions from the profit, which are left at the disposal of enterprises, for the material incentive fund. Today the share of this factor comes to only 3 percent, which is quite insufficient. In our view, it would also be advisable for the period of assimilation of new equipment to establish the profitability at the level achieved with respect to the product being replaced. And for equipment, which is produced in accordance with single and one-time orders, to plan the average sectorial profitability according to similar or related types of products.

[Question] Vladimir Yegorovich, to all appearances many contradictions and biases in the economic practice of scientific production associations occur due to the fact that scientific production associations are forced to live according to the laws of ordinary enterprises with series production. Apparently, for the new organizational structures, which are intended for science-technology-production integration, their own standard legal status is necessary. This has been spoken about for a long time....

[Answer] And not enough is being done. In November of last year through the joint efforts of USSR Gosplan and the Bureau of the USSR Council of Ministers for Machine Building a draft of the Statute on the Scientific



Production Association was prepared. The document is of a quite advanced nature. We provided several of our own remarks on it and expected that we any moment we would begin to live according to our own scientific production laws. However, month after month passes, while the integration formula, as before, remains on the paths of yesterday's instructions.

Recently I had occasion to speak at a meeting of the Collegium of the USSR State Committee for Labor and Social Problems. Availing myself of the opportunity, I raised the question of the revision of the wage system for managers, to whom the functions of sectorial management had been assigned in place of the 50 laid off personnel of a main administration. "But on what grounds?" they ask. "The All-Union Scientific Production Association is an independent action of your ministry. Have them look into it." Unfortunately, we are simply operating "outside the law."

The problems of stimulating the production of new equipment, about which V.Ye. Kurtashin spoke, of course, concern not only the All-Union Scientific Production Association. To one degree or another the managers of other enterprises are faced with them. One must admit: the economic mechanism even under the conditions of the self-financing and self-support [samookupayemost] of enterprises for the present is poorly influencing the acceleration of scientific and technical progress. The general director of the Kriotehnika All-Union Scientific Production Association has offered specific suggestions. We invite economists, economic managers, and our other readers to continue this discussion.

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#### **Microelectronics Center Of Electrical Engineering Institute**

*18140161b Leningrad LENINGRADSKAYA PRAVDA  
in Russian 26 Apr 87 p 1*

[Article by Doctor of Technical Sciences Professor O. Alekseyev, rector of the Institute of Electrical Engineering imeni V.I. Ulyanov (Lenin) and USSR State Prize winner, under the rubric "The VUZ: Tomorrow's Schedule": "Toward Future Technology. A Unique Microelectronics Has Been Set Up at the Institute of Electrical Engineering imeni V.I. Ulyanov (Lenin)"]

[Text] Just recently, only a few years ago, everyone was convinced that matters with the training of specialists in the system of the higher school were quite satisfactory. Indeed, everything was normal with the quantitative indicators, in accordance with which the work of higher educational institutions as a whole was also evaluated. As to the quality of training....

Today we are reaping the bitter fruits of the flaws in the high-quality training of personnel, particularly engineers. It is entirely correct that the concept of the reform of higher and secondary specialized education devotes

great attention to this issue. Now the statutes, which envisage the increase of the quality of training of specialists, are already becoming reality. As higher educational institutions a turn toward the broader introduction of seminar courses has begun and a shift from the unnecessary guardianship of instructors to independent work of students has emerged.

We have also taken aim at this. But the training of tomorrow's engineers has its own specific nature. This training should be carried out with consideration of the continuous development of science and technology. We are obligated not only to teach students to "associate" with the latest technologies, but, what is most important, to instill in them a desire to think in new ways.

How is this result to be achieved? The answer, it would seem, is simple: it is necessary to involve students more extensively in scientific research. However, doing this is not that easy. The weakness of the material base has an effect, the contact of the higher educational institution with sectorial ministries is not strong enough. IntraVUZ departmental barriers, such as, for example, the narrowness of chair interests, are also interfering.

In order to overcome these obstacles a new independent educational scientific subdivision—the microelectronics center—was set up 2 years ago at the Institute of Electrical Engineering imeni V.I. Ulyanov (Lenin).

Just what tasks face it? One of the most important ones, which is directly connected with the reform of the higher school, is the "leading," with allowance made for the rapid development of science and technology, training of engineers and the improvement of their skills. Students are being actively involved in all of the center's affairs. Many of them have become direct participants in research.

The center is a good base for improving the skills of our instructors. They can not only give lectures and conduct other lessons on theoretical materials, but also use the latest technology being developed by the center.

Scientific research holds an important place in the new subdivision's work. Today the role of microelectronics in all sectors of the national economy is well known even to the layman. Integrated circuits and microprocessors are being used in complex radio equipment, production control systems, and computers, and the "brain" of robots is built on their basis. Unfortunately, the present technology of producing integrated circuits is imperfect in many respects. For example, mechanical operations are widely used in it. The efforts of scientists and specialists are now aimed at developing a fundamentally new microelectronic technology, which is based on the computer-aided manufacturing of integrated circuits. The microelectronics center will also take part in this important work.

We will also be conducting other research.

The task posed for the center of developing submicron technology and the computer-aided manufacturing of integrated circuits is extraordinarily complex and is of a comprehensive nature. Of course, it cannot be "taken in" by the forces of one or two chairs. The participation of physicists, process engineers, instrument makers, programmers...is needed here. All these specialists are available at the institute, but they work at different chairs. We found a solution, having united them in one "temporary scientific collective." And today it is already clear that this step has fully justified itself: research is being conducted very actively.

Of course, the advanced retooling of the microelectronics center was also required. In many respects ministries and departments, which are interested in the development of submicron technology and in the automation of the production of integrated circuits, took upon themselves its equipment. Such cooperation is mutually beneficial. I will cite an example: the Sumy Elektron Association furnished us with a set of expensive electron microscopes. We in turn undertook to consider the problem of automating their operation. Today substantial results, the introduction of which has already provided an economic impact of 500,000 rubles, have been obtained in this area.

The Elektron Production Association is not our only partner. The center cooperates with the Svetlana and Pozitron production associations, the Scientific and Technical Association of the USSR Academy of Sciences, the Physical Technical Institute of the USSR Academy of Sciences.... Thus, in addition to training highly skilled personnel and solving important microelectronics problems the center will assume the duties of rendering services to interested enterprises. The range of services includes the production of models of integrated electronics and optics, the renting of the center's specialized equipment, the appraisal of new developments....

Of course, much work still lies ahead. Technological equipment continues to arrive: the center is equipped with computer hardware, automation equipment, and control and measuring instruments. We have to combine all this into a flexible automated line, which we are planning to interface with a computer-aided design system.

In a word, the plans are big. However, it is necessary to solve more than one serious problem in order to fully implement them. Take the staffing of the center. We expect that the Planning Commission of the Leningrad City Soviet Executive Committee will make provide for an additional number of scientific and engineering personnel for the increase of its "capacities."

Another problem involves the equipment of the center. Here, it would seem, things are going well, we are being supplied, I will repeat, with the most advanced equipment. However, in order to solve tomorrow's problems it should be updated if only once every 3 years. In our

view, it is necessary to carry out this supply in a centralized manner, according to a schedule that has been drawn up in advance. We need the active assistance of USSR Gosplan and other interested ministries and departments in this matter.

Today the "operational" developments of the center are in many respects of a resourceful nature. I would like the USSR State Committee for Science and Technology to examine the question of including them in the national economic plan, which would ensure the mass introduction of the center's developments.

There are many problems. But we are looking to the future with optimism. Research is under way and the first significant results, which have interested our partners, have been obtained.

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#### **Koptug On Tasks, Personnel Of Siberian Department**

*18140172a Moscow SOVETSKAYA ROSSIYA in Russian 1 Jun 87 p 1*

[Interview with Valentin Afanasyevich Koptug, chairman of the Siberian Department of the USSR Academy of Sciences, by A. Nemov and N. Pritvits under the rubric "Our Dialog": "The Foundation of Practice"; date, place, and occasion not given]

[Text] [Question] Valentin Afanasyevich, when the Siberian Department of the USSR Academy of Sciences was established, there were several points of view on its tasks. Some scientists, including Academician Lavrentyev, saw in it the uniting of scientific forces which are capable of solving many problems of the world level. Others regarded such an approach as "the dispersal of forces," proposing to orient the department toward purely regional tasks. Since that time 30 years have passed....

[Answer] It is necessary to elaborate. Mikhail Alekseyevich Lavrentyev was not opposed to regional tasks. He believed that progress is impossible without the development of basic research. Without having strong scientific schools of, for example, mathematicians, physicists, or chemists, is it possible to solve the problems of metallurgy, machine building, or power engineering? Not to understand this means to be nearsighted. Basic research makes it possible to develop truly advanced technologies, which promise a revolution in production, and in the end ensures a saving of many millions of rubles of assets.

We have become accustomed to regard Siberia as an accessible store of minerals. But with each year it is becoming more and more difficult to extract raw materials, the search for them is becoming more and more expensive. Hundreds of millions of rubles are being spent annually on geological prospecting. Therefore, the development of a well-balanced theory of the formation

of the earth's crust of the Siberian region and its present structure is acquiring today particular importance. Such a theory and basic research are capable of making exploration purposeful. Not by chance did the joint work of geological scientists of the Siberian Department of the USSR Academy of Sciences, sectorial institutes of the USSR Ministry of Geology, and production organizations of the RSFSR Ministry of Geology recently lead to the discovery of a large number of deposits, which formed a new petroleum and gas province in the eastern part of the country. Research at the Institute of Nuclear Physics of the Siberian Department of the USSR Academy of Sciences led to the development of elementary particle accelerators which are being used for new highly efficient radiation technologies. In the Ministry of the Electrical Equipment Industry alone the hardening of cable items by means of the new method yielded during the 11th Five-Year Plan a saving of 250 million rubles.

It is possible cite several examples of when important scientific research of the Siberian Department has made it possible to make a revolutionary breakthrough in machine building, electronics, and chemistry. The foundation of this was also laid 30 years ago. But, while developing basic research, in the department they were well aware that some jobs would be able to yield a practical return not in 1-2 or even 5 years, but significantly later. To support this research means to work for the long run, for the future. Unfortunately, it is most difficult of all to obtain resources for precisely such jobs. To some people the investment of millions in problems, which will make themselves felt only after a few five-year plans, seems seditious. Partly for this reason the economy for a long time, figuratively speaking, lived for "one day," which led to a lag in the development of fundamentally new technologies.

Now significantly more capital has to be invested in order to catch up with the leaders than if we had simply kept pace with them. The role of the Academy of Sciences as the strategist of scientific research is unusually great. And in developing the ideas which were incorporated when organizing the department, we are proceeding precisely from this.

If we speak about the tasks of the department in the region, this is the development of the scientific base of the transformation of the productive forces of Siberia. In particular, the Sibir Program, which unites 700 organizations of 90 ministries and departments, is aimed at this.

The Sibir Program originated as an organizational form of the uniting of scientific forces—regardless of their departmental affiliation. The specific nature of the region required this. Given such large-scale development of natural resources and its pace the price of a mistake is too high. It must not be permitted that harm would be

done to the region as a whole, its nature, and its harmonious development in the interests of some one department. In particular, the history of Lake Baykal teaches us this....

The scale of construction in the region of the Baykal-Amur Railway Line required, for example, serious research on earthquake prediction and seismic regionalization. The work of the Institute of the Earth's Crust (Irkutsk) and the Yakutsk Affiliate of the Siberian Department of the USSR Academy of Sciences made it possible to substantiate the decrease for the southern part of Yakutia, in the zone of the Baykal-Amur Railway Line, of the degree of seismic intensity by one point. As a result, without lowering the demands on the safety of structures, it was possible, according to the estimate of specialists, to save 100 million rubles.

A wide range of problems are connected with the development of the Kansk-Achinsk Fuel and Power Complex, where more than 600 million tons of lignite, a fourth of which lend themselves to strip mining, are concentrated. Serious attention here should be devoted to the scientific study of new mining technologies, the improvement of the methods of burning coals, the reduction of harmful air emissions, and the complete use of ash dumps.

In all 43 subprograms are in effect within the Sibir Comprehensive Program. The expenditures on this research during this five-year plan will come to 193 million rubles a year (during the 11th Five-Year Plan it was 114 million rubles). The economic impact from the developments and recommendations of the program during the past five-year plan could have come to 15 billion rubles. It was actually possible to obtain considerably less—a little more than 1.7 billion rubles, or on the average 340 million rubles a year. Last year they reached the 450 million ruble level. This means that the return from the work on the Sibir Program comes to 2.5 rubles per ruble of expenditures. It is comparatively good, but one-seventh to one-fifth as much as there could have been.

[Question] Valentin Afanasyevich, the problems of introduction are being spoken about at all levels and have been for more than a year, but it has not been possible to achieve a radical change of the situation. Why?

[Answer] At first glance there are simply amazing examples. I have already spoken about the development of the Institute of Nuclear Physics of the Siberian Department of the USSR Academy of Sciences—elementary particle accelerators, which gave the Ministry of the Electrical Equipment Industry a saving of many millions of rubles. At the same time this ministry is just beginning the preparation of the commercial production of the accelerators.

Of the works of the Siberian Department of the Academy of Sciences, which were recommended for introduction by the RSFSR State Planning Committee, only a third were included in the State Plan for the 12th Five-Year Plan. The RSFSR Ministry of Health, for example, rejected 14 of the 16 proposed works, included tested effective agents for the treatment of viral and purulent diseases.

These examples clearly reflect the situation, when the economic mechanism does not promote the introduction of the achievements of scientific and technical progress in practice. The executives of enterprises, ministries, and departments know: new equipment is "the fraying of nerves," the possible upsetting of plans and obligations, and "extra" expenditures. Now the economic mechanism is being improved, and it is important that the questions of introduction would find a worthy place in it.

It is necessary to tighten up the monitoring of the organization and progress of applied research at academic organizations. Many jobs at our institutes are carried out without proper scientific and technical substantiation and comparison with the level of world achievements. In the long-range planning of applied research there is something for academic science to learn from sectorial science. Before the start of the work it is necessary to specify more clearly its goals and deadlines. To monitor them in the process of realization.

We made a unique inventory of completed developments. We looked at what the degree of their readiness is and whether there are problems of introduction. We analyzed the leading works. We are planning to obtain a unique data bank on applied research. It is now already easier for us to check at what stage "slipping" appears and how it is possible to help developers.

But I will emphasize: such an approach is inapplicable to basic research.

Today the search for new forms of the interaction of science and practice is extremely important. About 20 interbranch scientific technical complexes (MNTK's) have now been established for the surmounting of departmental barriers and the acceleration of the transfer of new developments to sectors. They are at different stages of organization, accordingly the return from them for the present also differs strikingly. But in principle it is already possible to speak of the general trends of development of interbranch scientific technical complexes. The establishment of complexes is advisable only on the basis of large scientific institutes, which have a large reserve of basic developments of a world level. The attachment to such institutes of powerful production bases and design and technological bureaus will make it possible to quickly bring the ideas of scientists up to practicable industrial designs and to begin the duplication of new equipment. In the opinion of the Presidium of the Siberian Department of the USSR Academy of Sciences, in the department the Institute of Catalysis

conformed most completely to such tasks. The new types of catalysts, which were developed here, made it possible to change radically the course of many chemical reactions in industry and to improve substantially the characteristics of technological processes. And although the Katalizator Interbranch Scientific Technical Complex was formed only a year ago, 13 of its developments have already been included in the state plan for the five-year plan.

The republic engineering and technical center (Tomsk) is working on the task of introducing advanced technologies for the hardening of parts in various sectors of the RSFSR. It was set up under the Institute of Strength Physics and Material Science, but already now is successfully introducing developments of not only this institute, but also many others. And whereas today 300 people work at this cost accounting center, in 1990 we would like to see there 1,300 specialists.

[Question] In recent years the "aging" of scientific personnel has occurred. The Academy of Sciences, in examining the situation with management personnel, made the decision that people no older than 65, if they are not members of the USSR Academy of Sciences, and no older than 70 for corresponding members and academicians can hold the positions of directors of institutes, their deputies, and chiefs of departments and laboratories. What is the personnel situation at the Siberian Department?

[Answer] In 3 decades powerful scientific schools have been formed, a new generation of prominent researchers, including academicians and corresponding members, who already have their own students, has grown up. Therefore, the succession of generations of executives of institutes took place not very painfully. The average age of directors of institutes at the department is 56.

At the same time we are now quickly losing the age advantages, for which we were previously distinguished in the academy. Whereas in 1973 scientists younger than 40 made up more than 20 percent among doctors of the department, now they make up only about 6 percent.

It worries us that the proportion of scientists 30-40 years old is small. This signifies that researchers, who by this age have acquired certain experience and scientific knowledge, and usually an academic degree as well, frequently leave the Siberian Department. Why? An analysis of the social problems of scientific youth of the Novosibirsk Scientific Center was recently made. It turned out that the majority of young scientists (up to the age of 33) are satisfied with the prospects of occupational advancement, but more than 70 percent of those surveyed view pessimistically the possibilities of promotion (including the increase of the wage). A significant portion of the young scientific associates believe that their potentials are not not being fully used, that they could work more productively.

Today it is necessary to devote particular attention to the advancement of talented young people. We are attempting to move in several directions. First, we are supporting many initiatives of young people themselves. For example, the establishment in Novosibirsk of a cost accounting introducing organization. By means of it the developments of young scientists could receive extensive recognition significantly more rapidly. Second, the certification of scientists is contributing to the movement of personnel and the increase of the efficiency of their use. It helped collectives get rid of "ballast" and made it possible to promote the most capable people.

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### **Establishment of the Ural Department of the USSR Academy of Sciences**

*18140203 Moscow PRAVDA in Russian 16 May 87 p 2*

[Article by *Pravda* special correspondents V. Danilov and V. Reut (Sverdlovsk): "Formation. The Ural Department of the USSR Academy of Sciences: At the Beginning of the Path"; first three paragraphs are PRAVDA introduction]

[Text] The wind valiantly blew away the snow blizzard on the vast outlying vacant lot bordered by coniferous forests. Temporary structures and a single truck taking shelter near them could be seen in the distance.

"A city will be established here," the associate at the Ural Scientific Center of the USSR Academy of Sciences accompanying us declared in a jocular spirit. "Well, not quite a city—an academic town. The firstling—the building of the Institute of Metallurgy—is already being built."

We approach the spruce rising over zero-cycle building walls. There is not a soul at the construction site.

This was almost 15 years ago. We then wrote a report on the need to speed up the construction of the Sverdlovsk academic town. Until recently, however, the situation was not very good there. True, during the existence of the Ural Scientific Center of the USSR Academy of Sciences the above-mentioned firstling was nevertheless completed. Laboratory buildings of institutes of plant and animal ecology and of geophysics appeared in Sverdlovsk, of the Institute of Mechanics of Continuous Media, in Perm, of the Physico-Technical Institute, in Ustinov, and of the Ilmen reservation, in Miass... However, the vacant lots of the academic town were overgrown primarily with weedy grass. Meanwhile, some institutes, including the oldest ones, to this day are huddled in a rather dilapidated building of the Ural affiliate of the USSR Academy of Sciences existing as long ago as the prewar period, which means under crowded and disadvantageous conditions.

A higher-rank organization—the Ural Department of the USSR Academy of Sciences—is now being established at the base of the scientific center. It will place the entire economic region under its guardianship: A big ship requires deep waters.

However, this ship must also be equipped in accordance with the goals set.

To overcome the lack of coordination. The Ural Scientific Center extended its influence by no means to all national economic sectors and territories of the economic region. For example, in Chelyabinsk Oblast, where, in fact, the first shoot of academic science—the Ilmen reservation—has appeared, it remains the only one for the time being. In Kurgan and Orenburg oblasts there are no academic subdivisions at all. They will have to be established on the basis of higher educational institution and sectorial science. In the Komi ASSR there is an affiliate of the USSR Academy of Sciences. Geological and biological sciences have been developing in it for a long time, but subdivisions of physico-mathematical specialization are absent or weak. The affiliate will now form part of the department as a scientific center and it will become possible to strengthen its weak links.

Thus, in the meantime the immediate task—to overcome the lack of coordination in the institutions of academic science in the Urals and to strengthen other cachectic subdivisions—is being accomplished. These are the first steps in the establishment of the powerful comprehensive academic center. Since it is nondepartmental in its nature, it will be able to become a true forger of a unified scientific and technical policy in the region. This is especially important for such a major industrial region in the country.

However, the following seems surprising and not quite justified: the Bashkir affiliate of the USSR Academy of Sciences—an autonomous republic, which literally is wedged in the heart of the Ural Economic Region—did not form part of the department. Why? Localistic frames of mind and the desire to retain some independence in the implementation of "its own" scientific and technical policy have triumphed. Will such an isolation be of benefit to science and the national economy of the autonomous republic and, moreover, the region as a whole?

Of course, "collecting" scientific institutions and strengthening the individual links of science will not do. Earth and metal sciences and research in the field of chemistry developed primarily in the Urals until recently. This was justified by the direction of the region's industry. Serious corrections and, at the same time, new institutes are needed now.

Something is already being done in this direction. The Institute of Electrophysics and an affiliate of the Institute of Machine Science of the USSR Academy of

Sciences were opened in Sverdlovsk last year (subsequently, as expected, the affiliate will be transformed into an independent institute and will form part of the department).

"The material base of academic science in the Urals requires serious development," academician G. Mesyats, chairman of the presidium of this department, notes. "The funds spent on capital construction thus far have been one-fifth of what they should have been. Therefore, the academic town has not developed. Furthermore, is it possible to do without design offices or experimental subdivisions? This year we have organized special design offices of scientific instrument making and design offices are being established under the Physico-Technical Institute in Ustinov and under the Institute of Organic Chemistry in Perm. Next year we will begin building special design offices of metallurgical and chemical technologies in Sverdlovsk. Such subdivisions will also be needed in other cities. With regard to experimental bases during this five-year plan we will have to rely on the capabilities of enterprises and sectorial institutes during this five-year plan. For example, in Sverdlovsk alone there are about 10 scientific research institutes of metallurgical specialization. The material and technical potential of some of them is very significant."

Gennadiy Andreyevich is convinced that many troubles of regional academic subdivisions are the results of the inattentive attitude toward the needs for their development. The heretofore characteristic lack of understanding of the role played by fundamental science in the country's economy had an effect. This was also reflected in the embodiment of research results. Even seemingly indisputable achievements were nearly always suppressed by departmental approaches. Academic science is supradepartmental and supraregional. However, in order to realize these advantages, it should be strong and capable of actively overcoming sectorial barriers and affecting the progress of the entire national economy of an economic region.

"To invest money in the development of academic science in the Urals is a risk-free business," the scientist is confident. "The introduction of new equipment and technology can bring great benefits here. After all, the Urals occupy one of the leading places in the RSFSR in industrial output. A significant acceleration of scientific and technical progress in 5 to 10 years will help to cause a serious spurt in an increase in production efficiency and will have an effect on the entire country. We intend to strive for this, strengthening the positions of science and its material base. It seems advisable for the Uralsibstroy to have within its structure a special powerful subdivision for the construction of scientific projects, which itself would build or act as a general contractor; for example, in Sverdlovsk in the construction of the academic town."

"However, scientific personnel will also be needed...."

"Now we have 5 academicians and 18 corresponding members of the USSR Academy of Sciences. This is less than at the Siberian Department now, but more than was there during its establishment. Of course, serious growth is needed. A doctor of sciences is the main figure in any academic center. For now we have 200 doctors of sciences—not enough. However, throughout the Urals there are almost 2,000—this is already a force. Apparently, in part we will grow owing to its redistribution and placement in the orbit of academic science. At the same time, we will begin to more actively train scientists from talented youth."

Gennadiy Andreyevich believes that despite shortcomings and difficulties academic science in the Urals has made considerable advances in various directions. They must be introduced into production more rapidly.

**Transferred as Legacy.** In academic institutes in the Urals there are many interesting projects, whose results literally cry out to be widely introduced into practice. A. Baraboshkin, director of the Institute of Electrochemistry, corresponding member of the USSR Academy of Sciences, discussed and showed what had already been achieved in the course of research on the properties of solid electrolytes. At room temperature they are insulators, but when heated to 700 or 900 degrees, such ceramic material becomes a conductor, in which oxygen ions move.

On this basis the institute obtained galvanic elements, whose application made it possible to manufacture solions, or, as they are still called, electrochemical converters of information. They have already been installed at a number of thermal electric power stations and metallurgical furnaces, determining the completeness of fuel combustion and aiding in fuel saving.

"If electric current is supplied to such a device," says A. Baraboshkin, "it will act as an oxygen pump, sucking this element out of the air. If such a 'pump' is placed in a socket, pure oxygen will be obtained."

It is no less important that a similar device can operate as a high-temperature fuel cell and a chemical source of electric current. Batteries for specific voltage and power are made from such cells. The device "is heated" with natural gas and generates current. We saw an experimental 100-watt model in operation.

"The batteries can greatly vary in power," Aleksey Nikolayevich explains. "In principle, new-type industrial electric power stations occupying small areas and operating without turbines are possible. Power engineers are already interested in this. However, a plan for the output of such ceramic materials and articles from them is needed."

The institute also has other, no less valuable, developments, which in part have already forced their way into practice, as in the department's other scientific institutions.

We visited the Kirovgrad Hard Alloy Plant. It utilizes the developments of the Institute of Chemistry. In particular, it produces tungsten-free alloys, which are of great benefit for the national economy. The Institute of Physics of Metals developed nondestructible check facilities. They are applied at Uralmash, the Sinarskiy Pipe Plant, the Verkhneserginskiy Chisel Plant, and others. The Institute of Metallurgy has developed and is introducing into practice new technological processes for obtaining hardeners from alloys with niobium, barium, magnesium, and rare metals, which makes it possible to expand the production of high-grade steels. Many good words can be said about these and many other endeavors of scientists at the Ural Department. But it is much better if production workers appreciate them at their true value and add them to their arsenal.

Research strategy. Of course, one legacy alone, which the department inherited from the scientific center, is obviously insufficient. New ideas, new directions, and, therefore, new scientific research results are needed. Therefore, it was decided to pay paramount attention to fundamental research—the source feeding applied developments. Constantly replenishing this source, we will have to more actively draw out from it and to more rapidly realize the opportunities opened up by it. Here a significant restructuring is needed in the work of all the scientific organizations of the department and of all its associates, which has the goal of maximally increasing the yield of science and its effect on further progress and production intensification.

Special attention will have to be concentrated on the development of major directions, which often require research cooperation and the utilization of the knowledge and experience of specialists in different fields. United scientific councils for sectors with extensive rights in the solution of important problems concerning the development of science and technology will play their role here. Prominent scientists not only at academic institutes, but also at higher educational institutions, and sector workers will be members of these councils.

Plans are made to more widely utilize research possibilities within the framework of temporary scientific collectives, especially as their indisputable productivity is confirmed by experience. The temporary collective for the problem of "high-temperature superconductivity" has now combined the efforts of scientists at the department's three institutes and at Ural State University and of enterprise specialists. The overall program of this collective is supported by the Sverdlovsk Oblast Party Committee. Its fulfillment will help to more rapidly accomplish scientific and practical tasks of great significance.

In essence, all this was discussed at the out-of-town meeting of the Presidium of the USSR Academy of Sciences held in Sverdlovsk in February. Basic prospects for the development of the region's academic science and its goals and tasks were mapped out.

However, no strategy is possible without taking into consideration the quantitative and qualitative composition and the present material and technical equipment of the army that will have to implement it. In this sense confidence was expressed that by the year 2000 the Ural Department will increase twofold. Scientists will receive at their disposal the latest instruments and other technical means of intensifying and raising the level of scientific research. Science will develop at rapid rates in the Komi ASSR, Chelyabinsk, Perm, Kurgan, and Orenburg. Resources will begin to be allocated primarily where the necessary infrastructure is prepared and where local bodies show understanding for the need to develop science and create the conditions for scientists' daily life and work.

Concluding his speech at the meeting in Sverdlovsk, G. Marchuk, president of the USSR Academy of Sciences, said: "The establishment of this department is a necessary and timely matter. The Presidium of the USSR Academy of Sciences will provide every kind of assistance for its formation."

This formation has begun. The Ural Scientific Center of the USSR Academy of Sciences has handed the baton to a scientific complex of a higher organizational structure. Foundations have been laid for a new major stage in the development of science and productive forces in the region.

**Economic and Social Aspects of Production Automation**

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No 9, Sep 87 pp 39-40*

[Article by S. S. Verkhovskaya, candidate of technical sciences; A. S. Pisarev, candidate of economic sciences; T. S. Konovalova]

[Text] The relation in industry between consumption and accumulation funds (capital-output and capital-labor ratios) is to a considerable degree determined by scientific-technical progress (first of all, production automation, which is a powerful lever for improving the social and economic efficiency of social production.

The acceleration of scientific-technical progress (NTP) in the past 15 years has been accompanied by steady growth in measures introduced and their increased cost. During this period the cost per measure involving new technology increased by 7.8 percent during the 10th Five-Year Plan and 12.8 percent during the 11th. Analysis shows that during this time there was a decline in the economic efficiency of NTP measures. For example, the number of conditionally released workers per measure declined by 37 percent, costs per such worker increased by 90.6 percent, reaching 22,300 rubles during the past five year plan. The annual economic effect from the introduction of each measure increased by only 2.5 percent, while profits only grew by 200 rubles. In general, the efficiency of outlays declined from 0.4 to 0.34 rubles/ruble.

Scientific-technical progress can develop on two tracks — evolutionary and revolutionary. The evolutionary path is the creation and production of new generations of equipment based upon known design and technical solutions. This path for NTP development was characteristic of the period analyzed. NTP did not fulfill its main function — assuring growth in economic efficiency. At the present stage there is a need to switch to the revolutionary track for NTP, characterized by the creation and introduction of fundamentally new technology, the productivity and reliability of which is 3-5 fold higher and unit metal consumption 12-18 percent lower. However, there is a kind of "crossover" track between the evolutionary and revolutionary tracks. It is characterized by the combination of two forms for NTP, which are now taking place.

The planning and introduction of NTP measures has the following directions: progressive technology, production mechanization and automation, computer technology, equipment modernization. Production mechanization and automation has a special role in improving production efficiency. This is explained by the following economic factors:

A reduction in the absolute growth in labor resources. During 1986-1990 this growth will be 3.2 million people. The number employed in material production will

increase only by 0.5 percent (i.e. 4.6 fold less than in the past five-year plan. To reach the planned growth (20-23 percent) in labor productivity it is necessary to widely introduce highly productive automated equipment, robot systems and flexible automated systems, which should reduce the requirements for labor power.

Qualitative changes in productive potentials resulting from the widespread production and use of automated equipment. Over a 15 year period the production of metal cutting machine tools increased almost 3 fold in value terms, but in physical terms it declined by 9.9 percent. In 1970 only 0.8 percent of all metal cutting equipment was progressive units with numerical control, while in 1985 almost 9.8 was (in physical units). In value terms the total production of such machine tools increased almost 25 fold. In 10 years the production of automatic manipulators with program control increased 132 fold. Over 14 years the number of mechanized flow lines installed in industry increased 1.8 fold, that of automated lines, 3.1 fold, comprehensively mechanized and automated sections, shops and production operations — 2.3 fold and of enterprises — 1.4 fold. All this helped considerably increase growth in the material base's capacity, in production volumes and labor productivity.

The rapid obsolescence of fixed productive capital and declines in renovation rates. This is a consequence of the prolonged evolutionary path for NTP development. For USSR industry as a whole the average annual renovation rate for fixed capital assets was 8 percent during the 9th Five-Year Plan, 7.4 percent during the 10th, 6.6 percent during the 11th.

Reductions in the output-capital ratio in industry. In 15 years it declined by 28.7 percent, including 12.7 percent in the past five-year plan. A reason for this is the rapid growth in the stock of highly productive, expensive equipment and its low utilization. In 1985 the shift coefficient for the entire stock of metalworking equipment in machine building was only 1.4, and it was even lower for NC machine tools and equipment with automatic manipulators. Therefore, the Basic Directions for the Economic and Social Development of the USSR National Economy foresee that by the end of the current five-year plan, the shift coefficient for the entire stock of equipment in machine building will increase to 1.6-1.8, that of NC equipment and automated lines to 1.9 and that of flexible production modules and systems to 2-2.5.

The more complicated the automatic equipment the higher its costs and, consequently, the greater should be its work load. Specialists at the Ivanovo Machine Tool Building Association imeni 50 Years of the USSR have calculated that flexible automated systems become economically efficient only when they work steadily around the clock.



The widespread use of standard manufacturing processes and group technology is among the most important organizational measures for increasing the economic efficiency of automated equipment, robots and robot systems and flexible production systems. Actually, however, in most cases the technological potentials of automated systems do not meet production requirements.

The extensive application of automation and comprehensive mechanization is changing industry's cost structure. In 5 years the wage and social insurance component declined by 0.7 percent while depreciation deductions increased by almost 10 percent. In our opinion this results from the extensive use of automated equipment.

The automation of production processes changes the content of labor functions and makes labor more mental. This direction in NTP has introduced a new tool — the automated control of technological processes.

Automation reduces the amount of heavy manual labor. At present 34.9 percent of all workers in industry do manual work. By the year 2000 it is planned to reduce this to 15-20 percent in the production sphere. However, 80-90 percent of all automatic devices are directed to basic production. In machine building, for example, 15-18 of all workers are employed in transport operations. Concurrently, a worker employed in transport and loading-unloading work has 2-3 fold less machinery than a worker employed in basic production. Uneven levels in the automation and mechanization of their work increase the percentage of auxiliary workers (in industry it is now 52 percent). The mechanization and automation of basic production is also uneven. It is 25-30 percent in assembly operations, which accounts for 25-40 percent of labor intensiveness.

The expanded scales of automated production also influence work organization and its norming and payment. The basic elements of this are: the development of brigade forms for work organization, the servicing of more than one machine tool, time and motion studies, strengthening the linkage between earnings and final results from work. In the past five-year plan the percentage of workers organized into brigades increased 1.7 fold, reaching 63.3 percent in 1986. The technical levels of production automation dictate the need to create comprehensive brigades consisting of workers managing the main equipment and fitters, electricians, electronics specialists, programmers, transport workers and even engineering-technical workers. Such brigades include 60.2 percent of all workers covered by collective forms of workorganization. The average size of a comprehensive brigade in automated production operations is about 52.5 percent higher than a specialized brigade. As automation becomes more complicated (the transition from individual automatic devices to automated lines, sections shops and flexible production systems) greater demands are made to reduce unproductive idle time of equipment for servicing and to increase the number of

comprehensive brigades to the optimal level. During the past five-year plan the average number of workers per comprehensive brigade increased by 3.4 people, and that per specialized brigade by 1.3.

At the present stage the norming of labor is characterized primarily by the replacement of one type of automated equipment by another more productive type. This leads to changes in work intensity and should have an influence upon the time per piece. For example, at the VAZ [Volga Motor Vehicle Plant] the time per piece includes the time a worker is engaged in useful work. The time for rest and personal needs depends upon this. In determining additional pay due to working conditions consideration is given to the structure of technically based time norms (through a coefficient of labor difficulty).

The role of production as one of the most important directions in NTP is steadily increasing. Statistical data show a general decline in the economic efficiency of automation, a substantial shortcoming. However, in view of the advantages of automated production (flexibility, high quality output, adaptability to design changes, longer service life), one can definitely say that it has a future.

An important way of most rationally and economically using automated production processes is improvements in planning by using systems of normative for social and economic efficiency, differentiated by the direction of NTP and by expanding the system of evaluation indicators. Among the latter one might include, for example, the capital-labor ratio and the output-capital ratio for installed equipment. Each evaluation indicator should have a normative value. The degree to which it is achieved must be calculated when evaluating the production-operational results of enterprise activity. Improvements in the system of evaluation indicators will permit the creation of real conditions for improving the economic efficiency of using scientific and technical achievements in general and, in particular when automating machine building.

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#### **Improvements in the Economic Evaluation of Technical Measures**

*18140136b Moscow MASHINOSTROITEL in Russian  
No 9 Sep 87 pp 40-41*

[Article by O. P. Mogilenskikh, candidate of economic sciences; S. P. Pavlov, engineer]

[Text] With the intensification of production based upon the maximum use of science and technology, the economic evaluation of technical measures becomes especially important. Every manager, designer and technologist making technical decisions should economically justify their suitability for the purpose.

There are two variants for evaluating alternative technical decisions: the exact correspondence of economic parameters and a calculation of the indeterminacy factor, when the suitability of a decision is based upon a given value for economic parameters. The most widespread is the second variant, in which, at all stages in developing and introducing a measure an engineer is focused upon improving economic indicators (reducing production costs, improving labor productivity and product quality).

Economic indicators are made more accurate at each stage in implementing the measures. As a result the completeness and reliability of information increases. It becomes necessary to compare several variants for one measure or several measures in order to rank them according to economic efficiency. At the stages preceding introduction, the indicator most sensitive to various changes is the one describing development costs. At the introduction stage production costs vary the most. Any technical solution in accordance with ESKD [Unified System of Design Documentation] is reflected in changes in technical documentation (ITD). This is the information basis for changes in norms for labor and material resources.

In the normative method for calculating costs changes in norms are a necessary condition for determining the actual efficiency of a measure's introduction. The active nature of the normative method for calculating costs can show itself most fully in a systematic calculation and analysis of changes in cost norms, reflecting improvements in equipment and technology. Any technical measure is reflected in the economic indicators of enterprise activity, above all in increased profits due to increases in production volume and reductions in costs.

When evaluating several alternatives for technical decisions, estimated efficiency can be kept within permissible ranges, for example the limits for effective variants to ITD in determining the efficiency coefficient. The following formula can be used in determining the annual increase in profits:

$$\Delta \pi = \left( \frac{A_2 - A_1}{A_1} \right) \pi_1 + \left( \frac{C_1 - C_2}{100} \right) A_2, \quad (1)$$

Where  $A_1$  and  $A_2$  — annual production volume before and after the introduction of the ITD, in thousands of rubles,  $\pi_1$  — profit from product sales prior to introduction of the ITD, in thousands of rubles,  $C_1$ ,  $C_2$  — costs per ruble of output before and after introduction of the ITD, in kopecks.

The coefficient of cost efficiency  $E_p$  is determined by the formula:

$$E_p = \frac{\Delta \pi}{K_n}, \quad (2)$$

Where  $K_p$  is costs involved in the development and introduction of the ITD.

To determine the limits for efficient variants of ITD  $E_r$  is replaced by  $E_n$  (normative efficiency coefficient) and formula (1) is used for  $E_g$ .

Because growth in profits, determining the size of (1) results from cost reductions and increased output, expression (1) is transformed by the introduction of new variables  $X$  and  $Y$  (to compare ITD with different characteristics), defined as follows: increased production volume resulting from ITD, percent; cost reductions per ruble of output resulting from the ITD, percent.

After the transformation we obtain

$$Y = \frac{100(100\phi + C_1X - 100X)}{C_1(100 + X)} \quad (3)$$

Where

$$\text{где } F = \frac{100E_n K_n}{A_1}$$

is the annual normative profit from introducing the ITD (in kopecks per ruble of production or other work prior to introduction).

As a result of various combinations of variables the limits of efficient variants for ITD are formulated. Variants can be calculated by computer using a special program or found with a nomogram. Either case assures the timeliness of evaluations of multivariant technical decisions at all stages of their development and introduction. Nomographic methods for evaluating the efficiency of technical measures have been introduced in a machine building plant in Sverdlovsk Oblast.

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### Use Of Electronics In Hungarian National Economy

18140187b Moscow EKONOMICHESKOYE  
SOTRUDNICHESTVO STRAN-CHLENOV SEV in  
Russian No 5, May 87 pp 19-24

[Article by Pal Laszlo, chief of the Main Administration of the Hungarian National Technological Development Commission, under the rubric "The Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000: The Strategy of Acceleration": "The Electronization of the National Economy of Hungary"; first paragraph is EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV introduction]

[Text] In the decisions of the 13th Congress of the Hungarian Socialist Workers Party (February 1985) the need for the rapid electronization of the Hungarian national economy is noted and it is emphasized that the rapid spread of electronics is of greater and greater importance from the point of view of both effectiveness of the entire economy and competitive ability of the output being produced on the world market.

In the Law on the 7th Five-Year Plan of the National Economy, which was approved by the Hungarian Parliament in December 1985, the Central Program of the Dissemination of the Public Sector Use of Electronics (the Program of Electronization) was formulated on the basis of the decisions of the congress. Its fulfillment provides for broad international cooperation, first of all on the basis of the electronization of the national economy—one of the priority directions of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 (KP NTP).

The electronization of the Hungarian national economy is also supported by the state program of the production of electronic components, as well as research technical goal programs, to which special attention is given in the Medium-Term State Plan of Scientific Research and Technical Development.

#### Fulfillment of the Central Program of the Development of Computer Technology

In the set of means of the reform of management of the national economy, which was carried out in 1968, central development programs hold a special place. Their goal is the creation of the conditions for the implementation of government measures that significantly affect the structure of production. Among these programs, which were implemented in Hungary during 1971-1985, the Central Program of the Development of Computer Technology, whose task along with the organization of the production of its means with allowance made for the integration ties of the countries of the socialist community within the Intergovernmental Commission for Cooperation of the Socialist Countries in Computer Technology (MPK po VT) was the formulation of standards of its use in our country.

This program provided for the organization of a system of institutions for research, the development of hardware and software, as well as production, trade, management, and international cooperation in this field. The extensive introduction of advanced third-generation production technologies, the training of specialists at educational institutions and in courses of instruction of users, the formation of a homogeneous and extensive domestic pool of computers on the basis of the unified system (YeS) of computers, and others were planned. Computer equipment should be widely used in the most diverse sectors of the national economy.

The constant updating of the program and its adaptation to technical progress throughout the national economy had the result that in the production of computer hardware in the country and in the methods of its use significant quantitative and qualitative changes took place.

In Hungary by the end of 1985 about 40 institutions for research, development, specialized service and production, the preparation of programs, and trade had been established, that is, a base for the functioning of a domestic integrated system of institutions for computer technology had been created. Instruction was introduced at all higher educational institutions in this discipline, acquaintance with the fundamentals was introduced at secondary schools, and the training of specialists, users, and managers was introduced in a broad system of courses.

In the traditional sectors—instrument making and communications equipment—base enterprises for the production of computer equipment were established. Its technology and methods began to be used extensively in the Hungarian electronics industry. Organizations of state management, foreign trade, and international in this area were formed. For the solution of special problems connected with the use of computer equipment hundreds of small cooperatives and organizations of a different type appeared.

In past years about 30,000 people have acquired a specialized education in the development, production, and use of computer equipment, moreover, about 300,000 have acquired a general knowledge.

The production of computer equipment has become a most rapidly developing sector of domestic industry: in the early 1970's it was only beginning, while by 1985 it reached 0.5 billion rubles a year. The Videoton enterprise, which specializes in the production of small computers, some peripheral devices, and equipment for remote data processing; the MOM enterprise, which is well known in the CEMA member countries as the manufacturer of peripheral devices; and the Telefon-Gyar enterprise, which produces terminals, have the best results in the country. The Central Institute of Physical Research, which is engaged in the development of mini-computers, is playing an important role for the development of this sector, while the SKI, the Computer and Automation Institute, and others are engaged in the development of microcomputers.

The pool of computers of Hungary, in which domestically produced hardware occupies the main place, numbered 80 units in 1970, but by 1985 the number of small-, medium-, and large-capacity general-purpose computers came to 1,400, minicomputers—700, and microcomputers—about 100,000. The share of computers from capitalist countries has been greatly reduced.

As the result of special measures of the governmental program in 1985 all Hungarian secondary schools had several microcomputers each. A significant portion of the schools had complete laboratories with these computers. Their allocation was also improved. Today, regional service centers, as well as auxiliary systems of regional management operate in all the megyes and large cities.

Qualitative changes have also occurred in the use of computer equipment. Whereas at first it was used exclusively at several research and other professional institutions, in 1985 it was used already at most enterprises and institutions (about 6,000). At the same time as data processing computer equipment supported the control of technological processes and was used in research and experimental work, as well as in engineering design and the control and monitoring of production processes. The number of new methods of its use increased, for example, in the processing of images, in the editing of texts, and in expert systems.

The Central Program of the Development of Computer Technology also contributed to a significant degree to the development of related sectors. Together with the electronics industry the mass introduction of microprocessors in advanced products was begun in the most diverse fields of machine building. The production of medical instruments, in which the Medicor Association has developed and assimilated the production of more than 50 types of microprocessor devices, as well as machine tool building, which at first produced NC machine tools and then flexible production modules and systems with the use of microprocessors, serve as a graphic example of this.

The fulfillment of the Central Program of the Development of Computer Technology was based on cooperation in the Intergovernmental Commission for Cooperation of the Socialist Countries in Computer Technology. It played a decisive role in the formation of the assortment of products of our industry, in the direction of research developments, in the structure of our machine pool, as well as in the increase of the level of equipment and its employment. During this period we successfully cooperated in several fields with the corresponding sectors of industry of other fraternal countries.

However, the results of the fulfillment of the Central Program of the Development of Computer Technology only partially satisfy us. Today shortcomings still exist in the structure of our computer technology, this especially applies to the reliability of its systems and individual facilities, superhigh-speed computers, developed computer networks, size of external memory, certain services connected with the commodity turnover, and in individual cases the service of users.

#### Development of the Electronics Industry

In the structure of Hungarian industry communications equipment and instrument making always have played a very important role. At present their importance is constantly growing. The sectors, which in the aggregate

we usually call the electronics industry, include professional communications equipment, computer equipment, household radio equipment, instrument making, control and automation equipment, medical instrument making, and the production of electronic components.

The Hungarian electronics industry in recent years has been included among the most rapidly growing sectors. The production and sale of its products increased annually by roughly 10 percent and sometimes even more, and by 1985 reached approximately 70 billion forints (4 billion rubles).

The technological level of electronic items is increasing. Technologies based on integrated microcircuits are actually being used everywhere. Among them the share of domestic components based on microprocessors and components of large-scale integrated circuits is constantly growing. The share of intellectual labor in the electronics industry is growing at a rapid rate, true, it is still inadequate, especially in the development of systems engineering and programs, in maintenance, and so on.

The production of the Hungarian electronics industry is to a significant degree aimed at exports. The Soviet Union and other CEMA member countries are the main markets. Moreover, we are also delivering such products to both developing countries and developed capitalist countries.

The structure of items of our electronics industry conforms to the objectives of active international cooperation. We are participating in the work of CEMA organs and organizations, in the implementation of programs on electronics, and in multilateral and bilateral scientific and technical cooperation. In past years we actively participated in the development of a common unified base of products of electronic engineering, the development of unified systems of digital information transmission facilities and new generations of the unified system of computers—systems of minicomputers, the fulfillment of intergovernmental agreements on robotics and flexible production systems, and so on.

We also are actively cooperating in the field of licenses with western firms, which play an important role in the establishment of international standards in electronics.

#### New Tasks

The Program of Electronization was formulated on the basis of results of the fulfillment of the Central Program of the Development of Computer Technology with allowance made for cooperation with other CEMA member countries for the acceleration of the rate of technical development and the increase of the efficiency of the Hungarian economy as a component of the plan of development for its national economy during the 7th Five-Year Plan.

It specifies the tasks of organs of economic management and of individual ministries and departments in speeding up the electronization. A set of economic and technical means for the control of the electronization at enterprises has been developed.

The goal of creating such economic conditions, which enable enterprises to use advanced electronic solutions and to increase the interest in them, has been set. Various preferences are being offered for the acceleration of the pace of the dissemination of electronic systems (computer hardware, instrument making, communication and automation equipment), the development of the domestic commodity turnover in program aids, and the introduction of experimental developments. Government steps have been taken for providing the organizational and individual conditions of the use of modern electronics. They are being applied to all forms of instruction at institutes and secondary and primary schools and pose the task of the improvement of the training of managers, the increase of the skills of specialists, as well as the mass education of the population. A system of institutions, which design electronic systems, render services, and organize entrepreneurial activity, is being developed.

At the request of the Hungarian Council of Ministers detailed programs of the creation of conditions and deliberate preparation of social processes, which are connected with the acceleration of the pace of electronization, have been formulated by various public and mass organizations. The Hungarian Communist Youth League, various sectorial trade unions, societies of technology and the social sciences, and the corresponding cooperative and scientific organizations are engaged in the specialized training in this field of different strata of society.

Direct government steps, which are aimed at the rapid development of the infrastructure of electronics, including on the basis of specific programs, are specified in the national economic plan for the 7th Five-Year Plan. Particular importance is being attached to the development of communications and data transmission networks and computer services in state management, as well as to the serious improvement of the supply electronic equipment to educational institutions.

As compared to former years significant amounts of capital investments have been channeled into the development of the infrastructure of electronics.

In conformity with the Program of Electronization detailed sectorial programs, which include the electronization of production, managerial, economic, engineering design, and other processes, have been formulated by all ministries and state departments jointly with the most important enterprises and institutions, which are subordinate to them.

Such programs exist in agriculture, industry, transport, construction, water management, and so forth.

At the same time the tasks connected with the electronization of functional fields, for example, the banking system, the the public education system, trade, and so on, are acquiring greater and greater importance.

The Program of Electronization also specifies the tasks of industry and foreign trade, which are connected with meeting the needs for electronic equipment. The Hungarian electronics industry, relying on extensive international scientific, technical, and production cooperation, should expand the product assortment, modernize technology, improve the reliability of finished items, improve the conditions of their delivery, increase the share of mental labor, and improve maintenance. For the meeting of domestic needs, which are increasing in connection with the implementation of the Program of Electronization, and with allowance made for the anticipated increase of the requirements of socialist and other countries it is necessary to increase the output of products of the domestic electronics industry.

In satisfying the domestic demand we are counting on deliveries to Hungary in the future of products of an expanded assortment of the electronics industry of socialist countries, especially on developments which are envisaged by the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000. This will make it possible to reduce our dependence on imports from capitalist countries.

Special attention is devoted in the Program of Electronization to the implementation of scientific research and technical plans, which are connected with electronic items, technologies, and systems of use. The programs in accordance with the Medium-Term State Plan of Scientific Research and Technical Development include the most important assignments which are being carried out with state assistance. Among them are the development of new generations of computer equipment and an integrated digital communication system, the preparation of information for the most important new directions of the use of electronics, the development of flexible production systems and robotics, and studies of the social influences of electronization.

The programs on scientific research and technical development, which have been formulated at the state level, are supplemented by programs on the level of ministries, which are also engaged in the development of technologies for the electronics industry, the electronization of agriculture, designing with the use of computers, and the automation of the most important production processes, as well as office work.

We are basing scientific research and technical development with active international cooperation on traditional scientific, technical, and extensive license relations and on the creation of joint collectives of developers.

The goals of research and development are in accord with the obligations assumed by Hungary in the priority directions of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000—electronization and integrated automation.

In the accomplishment of the specific tasks of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 Hungary considers it vitally important to accomplish what has been planned as quickly and efficiently as possible. In accordance with a decision of the Hungarian Council of Ministers the National Technological Development Commission is responsible for the participation of national organizations in the realization of the priority direction—electronization of the national economy. The academic, industrial, institute, and plant research institutions, which are the coordinators for the problem, have been specified. Among them are all the important organizations of the country, which are engaged in research and development on electronization. Together with the interested institutions and enterprises the group of organizations, which are participating in the fulfillment of special tasks and themes, has been specified for individual problems. On the basis of an agreement with the main organizations with allowance made for the content of the research projects, which are being carried out in Hungary with state assistance, as well as their own material and intellectual resources they specify the method and level of specific participation. In most cases the expedient forms of cooperation have been agreed upon.

In solving the bulk of the problems of automation and electronization Hungarian enterprises and institutions adopted assignments that conform to their possibilities and interest. Already at the preparatory stage they actively participated in the coordination of technical and economic goals and the development of forms of cooperation.

We consider it especially important that in the system of cooperation, which is gathering momentum, the mechanism of the coordination of individual problems would operate so that possible parallelism would not lead to the dispersal of scientific efforts, while advanced forms of cooperation would ensure mutual interest.

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#### **Decree On Development Of Independent Creative Technical Work**

18140182 Moscow SOBRANIYE POSTANOVLENIY  
PRAVITELSTVA SOYUZA SOVETSKIKH  
SOTSIALISTICHESKIKH RESPUBLIK in Russian  
No 12, 1987 pp 259-269

[Decree No 157 of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee of 5 February 1987: "On Measures on the Further Development of Independent Creative Technical Work"]

[Text] The CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee note that the utmost development of independent creative technical work of USSR citizens is one of the important factors of the implementation of the policy outlined by the party of the acceleration of scientific and technical progress, increases the opportunities for the display of the initiative of the Soviet people in solving urgent national economic problems, and is conducive to the increase of their intellectual and cultural level, the revelation of individual creative capacities, the increase of self-consciousness, the organization of active and socially useful leisure time, the cultivation of creative labor skills among young people and adolescents, and the increase of the culture of everyday life and the living conditions of the population.

In recent years definite results have been achieved in the development of various forms of independent creative technical work, invention, and efficiency promotion. Amateur designers have developed numerous models of original equipment. The motor vehicles, small vessels, radio engineering complexes, aircraft, and various kinds of agricultural equipment, which have been developed by them, attest to the great creative potential of the people and the high individual skill of the authors. Many developments of independent authors contain original solutions at the level of inventions.

At the same time the organization, scale, and forms of this work do not ensure the active use of the creative potential of independent authors for the solution of national economic problems and do not make it possible to reveal fully the abilities and talent of enthusiasts of this matter.

For the purposes of the further development of independent creative technical work, the increase of the creative activity of Soviet citizens, and the strengthening of their influence on the acceleration of scientific and technical progress the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee decree:

1. To regard as one of the urgent tasks of party and soviet organs, USSR ministries and departments, trade union and Komsomol organizations, the All-Union Society of Inventors and Efficiency Experts, and the USSR DOSAAF Central Committee the utmost assistance to the independent creative technical work of USSR citizens, and first of all Komsomol members and young people, and the creation of the necessary conditions for its effective development.

It is necessary to ensure the close examination and qualified evaluation of all proposals and developments of independent authors and the production and testing by the forces of industrial enterprises and organizations of models in accordance with the most original and

effective of these proposals and developments and to see to it that no useful technical idea of independent authors would be ignored and left without subsequent use in the national economy.

It is necessary to organize the matter so that the labor of each creative collective of independent authors and each enthusiast would be surrounded with attention and care and that every manager of a scientific production and production association and organization would regard as his duty the creation of all the conditions, which ensure a high creative level of the developments of independent authors and their active participation in the solution of the most important scientific and technical problems.

Any case of inattention to the needs and problems of independent authors and evasion of the implementation of their proposals and developments, which are of practical interest, should be regarded by party committees and soviet and economic organs as a gross violation of party and state discipline.

2. To deem it expedient to establish in cities, rayon centers, and other populated localities clubs of independent creative technical work attached to scientific production and production associations, enterprises, and organizations of ministries and departments.

Clubs of independent creative technical work can also be established at palaces (houses) of culture and other institutions of executive committees of city, rayon, settlement, and rural soviets of people's deputies, organizations of the All-Union Society of Inventors and Efficiency Experts, houses of technology of scientific and technical societies, palaces (houses) of culture and technology of trade unions and, organizations and institutions of the system of vocational and technical education.

USSR ministries and departments, the councils of ministers of union and autonomous republics, the executive committees of local soviets of people's deputies, as well as the corresponding organs of public organizations are to ensure the establishment of the indicated clubs of independent creative technical work.

The managers of scientific production and production associations, enterprises, organizations, and institutions are to start on this work without delay, keeping in mind that already in 1987 the process of establishing clubs of independent creative technical work for the most part was completed and their high creative output began.

3. To establish that the coordination of the work on the organization, development, and promotion of independent creative technical work in the country is carried out by the USSR State Committee for Inventions and Discoveries with the participation of the Central Council of the All-Union Society of Inventors and Efficiency Experts.

For this purpose to form under the USSR State Committee for Inventions and Discoveries the Central Commission for the Promotion of Independent Creative Technical Work headed by the Chairman of this Committee.

To include as members of the Central Commission for the Promotion of Independent Creative Technical Work representatives of the USSR State Committee for Inventions and Discoveries, the USSR State Committee for Science and Technology, the USSR Academy of Sciences, the USSR Ministry of Higher and Secondary Specialized Education, the USSR State Committee for Vocational and Technical Education, the USSR Ministry of Education, the USSR Ministry of Culture, the All-Union Central Council of Trade Unions, the All-Union Komsomol Central Committee, the Central Council of the All-Union Society of Inventors and Efficiency Experts, the All-Union Council of Scientific and Technical Societies, the USSR DOSAAF Central Committee, and other interested ministries and departments.

The USSR State Committee for Inventions and Discoveries, the All-Union Central Council of Trade Unions, the All-Union Komsomol Central Committee, the Central Council of the All-Union Society of Inventors and Efficiency Experts, the All-Union Council of Scientific and Technical Societies, and the USSR DOSAAF Central Committee are to draft within a month a statutes on the Central Commission for the Promotion of Independent Creative Technical Work, while the Bureau for Machine Building of the USSR Council of Ministers is to approve this statute.

The public monitoring of the provision of the conditions for the efficient work of the clubs of independent creative technical work is to be assigned to the regional councils of the All-Union Society of Inventors and Efficiency Experts.

4. To permit the USSR State Committee for Inventions and Discoveries to establish in the central staff a special subdivision—a working organ of the Central Commission for the Promotion of Independent Creative Technical Work—without increasing the number of personnel of the central staff.

5. The USSR State Committee for Inventions and Discoveries, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee together with the USSR State Committee for Science and Technology, the USSR State Planning Committee, the USSR State Committee for Material and Technical Supply, the USSR Ministry of Finance, the USSR State Committee for Labor and Social Problems, interested USSR ministries and departments, the Councils of Ministers of union republics, and public organizations are to draft and approve in a 3-month period a model statute on clubs of independent creative technical work. To specify in the indicated statute the procedure of the

financing, maintenance, and material and technical supply of these clubs, measures of stimulation of the authors of the best developments and models of independent equipment, the procedure of the enlistment of engineering and technical personnel and the best inventors and efficiency experts for work (including through the combining of jobs) as managers of clubs, instructors, and consultants on creative technical work, as well as the procedure of turning over to members of these clubs for personal or collective use models of equipment, which has been produced by them or in accordance with their developments.

6. The Councils of Ministers of union and autonomous republics and the executive committees of kray, oblast, city, and rayon soviets of people's deputies with the participation of interested ministries, departments, scientific production and production associations, enterprises, and organizations and with allowance made for the proposals of the regional councils of the All-Union Society of Inventors and Efficiency Experts are to ensure the allotment of premises for the location of clubs of independent creative technical work and if necessary to organize the construction of such clubs with the proportionate participation of scientific production and production associations, enterprises, and organizations. To take advantage of the opportunities to enlist the population on a gratuitous basis in this construction.

7. Ministries, departments, scientific production and production associations, enterprises and organizations, and the executive committees of city and rayon soviets of people's deputies are to supply the clubs of independent creative technical work with the materials, equipment, accessories, and tools, which are necessary for the modeling, machining, production, and testing of parts, assemblies, and models of equipment which is being developed by independent authors.

8. Ministries and departments, scientific production and production associations, enterprises and organizations, and the executive committees of city and rayon soviets of people's deputies:

—are to ensure the establishment of working organs of clubs of independent creative technical work within the established limits and standards of the number and the wage funds;

—are to draw up starting in 1987 lists of sectorial and regional problems, which are recommended for solution by independent authors and whose accomplishment can yield a national economic impact;

—are to introduce in practice the holding of competitions for the best solution of these problems.

9. Scientific production and production associations, enterprises and organizations, under which clubs of independent creative technical work are established, and

the regional councils of the All-Union Society of Inventors and Efficiency Experts with the participation of the Komsomol committees and boards of scientific and technical societies to form with the enlistment of highly skilled specialists advisory groups for the provision of the necessary scientific and technical assistance to independent authors during their development of models of equipment, the conducting of an examination of technical specifications submitted by them, as well as for assistance in the making of an information search and the drawing up of applications for inventions.

10. To appoint the USSR Ministry of the Aviation Industry, the USSR Ministry of the Automotive Industry, the USSR Ministry of Machine Building for Animal Husbandry and Fodder Production, the USSR Ministry of Machine Building for Light and Food Industry and Household Appliances, the USSR Ministry of the Defense Industry, the USSR Ministry of Instrument Making, Automation Equipment, and Control Systems, the USSR Ministry of the Communications Equipment Industry, the USSR Ministry of the Radio Industry, the USSR Ministry of the Machine Tool and Tool Building Industry, the USSR Ministry of Construction, Road, and Municipal Machine Building, the USSR Ministry of the Shipbuilding Industry, the USSR Ministry of Tractor and Agricultural Machine Building, the USSR Ministry of Heavy and Transport Machine Building, the USSR Ministry of Chemical and Petroleum Machine Building, the USSR Ministry of the Electronics Industry, the USSR Ministry of the Electrical Equipment Industry, the USSR Ministry of Power Machine Building, and the USSR State Committee for Computer Technology and Information Science as the main ones in the development of independent creative technical work by basic types of equipment in accordance with the appendix, having made them responsible for the provision of the utmost assistance to clubs of independent creative technical work, for the organization of all-union reviews, competitions, and exhibitions, as well as for the use in the national economy of the most promising developments of independent authors in accordance with the types of equipment, which are attached to these ministries.

11. The USSR ministries and departments, which are indicated in Paragraph 10 of this decree, within a month are to specify approve the main scientific research institutes and design bureaus, which are made responsible for promoting the development of independent creative technical work on the types of equipment, which are attached to them. To form under the scientific and technical councils of the main scientific research institutes and design bureaus expert groups made up of the members of these councils and other skills specialists for the evaluation of developments of independent authors for with respect to the corresponding types of equipment, the examination and analysis of controversial problems, and the formulation of recommendations on the production and testing by the forces of scientific production and production associations, enterprises,



and organizations of the most effective of these developments, which are of national economic importance, and if, necessary, special expert groups.

12. On the recommendation of the expert groups, which have been formed in accordance with Paragraph 11 of this decree, ministries and departments:

—are to establish for scientific production and production associations, enterprises, and organizations assignments for the production and testing of models of complex equipment which has been developed by independent authors;

—are to afford independent authors the opportunity to test the equipment, which was produced by them at clubs of independent creative technical work, with the use testing facilities, equipment, stands, stations, and proving grounds, which are available at scientific production and production associations, enterprises, and organizations.

To establish that the outlays on the production and testing of equipment, which has been developed by independent authors, are made at the expense of the unified fund for the development of science and technology (the fund for the development of production, science, and technology and the fund for the assimilation of new equipment).

13. The USSR Ministry of Finance in consultation with the All-Union Central Council of Trade Unions and the USSR State Bank within a month is to submit to the USSR Council of Ministers proposals on the increase of the share of deductions by enterprises and organizations of the amount of the saving, which was obtained from the introduction of inventions and efficiency proposals, for the benefit of the All-Union Society of Inventors and Efficiency Experts for the assurance of the financing of measures on the organization of the promotion of the further development of independent creative technical work (the expansion of consultative assistance to independent authors, the holding of regional reviews, competitions, and exhibitions of developments and models of items of independent authors).

14. The USSR Ministry of the Aviation Industry, the USSR Ministry of the Automotive Industry, the USSR Ministry of the Shipbuilding Industry, the USSR Ministry of Internal Affairs, and the USSR DOSAAF Central Committee are to draft jointly with the USSR Ministry of Health and other interested USSR ministries and departments and to approve within a 6-month period for clubs of independent creative technical work, which develop aircraft, motor vehicles, small vessels, and other means of transport, statutes on the procedure of the issuing of technical conclusions on independent means of transport, their testing and registration, the issuing of operating licenses, as well as regulations of their use,

while planning to ensure the promotion of the development of independent creative technical work in this field and the observance of safety regulations and prevailing law and order.

15. The USSR Ministry of Trade and the USSR State Bank are to permit the sale from the trade network to clubs of independent creative technical work of nonfood goods by written order without inclusion in the limit of small-scale wholesale trade, with the inclusion of the volume of sold goods in the fulfillment of the plan of the retail commodity turnover.

16. The USSR State Committee for Material and Technical Supply, the USSR Ministry of Trade, the Councils of Ministers of union republics, and the USSR State Committee on Prices are to establish the procedure of the release (sale) by scientific production and production associations, enterprises, and organizations to individual citizens of materials, parts, and other resources from among waste products and nondisposable items for the purposes of independent creative technical work.

17. The USSR Ministry of Higher and Secondary Specialized Education is to stipulate in the Rules of Admission to Higher and Secondary Specialized Educational Institutions benefits for matriculants, who are active members of clubs of independent creative technical work and are enrolling in higher and secondary specialized educational institutions of corresponding type on the recommendation of the scientific production and production associations, enterprises, and organizations, at which the indicated clubs have been established.

18. The USSR State Committee for Inventions and Discoveries, the main USSR machine building ministries and departments, which are indicated in Paragraph 10 of this decree, the USSR State Committee for Vocational and Technical Education, the All-Union Central Council of Trade Unions, the All-Union Komsomol Central Committee, and the USSR DOSAAF Central Committee are to ensure the organization and holding of regular all-union, sectorial, and regional reviews, competitions, and exhibitions of models of equipment, which are being developed at clubs of independent creative technical work, with the giving of incentive to the authors of the best developments.

The main USSR machine building ministries and departments are to establish 3 annual prizes in the amount of 10,000, 5,000, and 1,000 rubles, which are awarded in accordance with the results of all-union competitions for the best developments and design solutions of independent authors with respect to the types of equipment, which are attached to these ministries.

The ministries and departments are to attribute the expenses on the organization and holding of the indicated reviews, competitions, and exhibitions to the unified fund for the development of science and technology (the fund for the development of production, science,

and technology and the fund for the assimilation of new equipment), while the USSR State Committee for Vocational and Technical Education is to attribute them to the overall saving on the estimate for the maintenance of organizations, institutions, and educational institutions of vocational and technical education.

The Exhibition of USSR National Economic Achievements is to organize a permanent exposition of the best models of items of independent creative technical work.

19. The mass media are to step up the promotion of independent creative technical work, to show more comprehensively the work of clubs of independent creative technical work, to cover more extensively the achievements of independent authors, which are submitted to all-union, sectorial, and regional reviews, competitions, and exhibitions of independent creative work, to popularize the winners of these reviews, competitions, and exhibitions, who are the developers of original equipment, and to show examples of the efficient use in the national economy of proposals of independent authors, as well as the results of the solution of important national economic problems on the basis of developments and technical ideas of independent authors.

The USSR State Committee for Publishing Houses, Printing Plants, and the Book Trade with the enlistment of machine building ministries and the Institute of the History of Natural Sciences and Technology of the USSR Academy of Sciences on orders of the Central Commission for the Promotion of Independent Creative Technical Work is to increase the quantity and to improve the quality of popular scientific literature, scientific methods materials, posters, booklets, and other literature on this problem, which are intended for various age and occupational groups of the population.

USSR ministries and departments, the All-Union Central Council of Trade Unions, the All-Union Komsomol Central Committee, and the USSR DOSAAF Central Committee are to consider the question of the publication of supplements to the corresponding sectorial and departmental journals on the themes of independent creative technical work and in consultation with the USSR State Committee for Publishing Houses, Printing Plants, and the Book Trade are to submit in accordance with established procedure specific proposals on the organization of their publication.

To deem it necessary to organize the publication of a special journal with a frequency of appearance of once a quarter, in which to cover questions of the organization and development of independent creative technical work in the country, to reflect the creative activity of clubs of independent creative technical work, and to publish materials on the most successful technical ideas, solutions, and developments of independent authors.

The USSR State Committee for Cinematography and the USSR State Committee for Television and Radio Broadcasting are to step up the promotion of independent creative technical work in documentary and popular science movies and television films and television and radio broadcasts, taking into account the positive experience of the television program "You Can Do This." To deem it necessary to make this program a regular one, planning to show it once a month at a specific and convenient time for independent authors.

20. The USSR State Committee for Inventions and Discoveries, the Central Council of the All-Union Society of Inventors and Efficiency Experts, USSR ministries and departments, and the central committees of trade unions are to envisage under the conditions of the All-Union Socialist Competition of Inventors and Efficiency Experts indicators, which characterize the work on the development of independent creative technical work, and the corresponding incentives for the competition winners.

21. The Central Committees of Communist Parties of the union republics and kray and oblast party committees are to ensure the monitoring of the implementation of the measures, which are stipulated by this decree, on the further development of independent creative technical work.

[Signed] Secretary of the CPSU Central Committee M. Gorbachev

Chairman of the USSR Council of Ministers N. Ryzhkov

Chairman of the All-Union Central Council of Trade Unions S. Shalayev

Secretary of the All-Union Komsomol Central Committee V. Mironenko

Moscow, 5 February 1987. No 157.

Appendix to Decree No 157 of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee of 5 December 1987

**The List of Types of Equipment, Which Is Attached to USSR Ministries and Departments, Which Are the Main Ones for the Development of Independent Creative Technical Work**

Description of Types of Equipment	Main ministry, department
Airplane models, hang gliders, light aircraft	USSR Ministry of the Aviation Industry
Motor vehicles, motorcycles, bicycles, motor vehicle trailers	USSR Ministry of the Automotive Industry

**The List of Types of Equipment, Which Is Attached to USSR Ministries and Departments, Which Are the Main Ones for the Development of Independent Creative Technical Work**

Description of Types of Equipment	Main ministry, department
Machines for animal husbandry and fodder production, general-purpose agricultural loaders	USSR Ministry of Machine Building for Animal Husbandry and Fodder Production
Production equipment for food, meat and dairy, flour-milling and groats, mixed fodder, elevator, light, and printing industry, trade and public dining enterprises	USSR Ministry of Machine Building for Light and Food Industry and Household Appliances
Optical instruments, still and movie cameras	USSR Ministry of the Defense Industry
Measuring and regulating instruments, computer and programming equipment	USSR Ministry of Instrument Making, Automation Equipment, and Control Systems
Telephone and television equipment	USSR Ministry of the Communications Equipment Industry
Radio equipment	USSR Ministry of the Radio Industry
Flexible production modules, robotics, metal working equipment, and tools	USSR Ministry of the Machine Tool and Tool Building Industry
Mechanized construction and installation tools, machines and equipment for construction and finishing work, air conditioning equipment, equipment and machines for cleaning cities	USSR Ministry of Construction, Road, and Municipal Machine Building

**The List of Types of Equipment, Which Is Attached to USSR Ministries and Departments, Which Are the Main Ones for the Development of Independent Creative Technical Work**

Description of Types of Equipment	Main ministry, department
Ship models, launches, yachts, light coasting hovercraft	USSR Ministry of the Shipbuilding Industry
Tractors, combines, and other agricultural machines, as well as assemblies, components, and parts for them	USSR Ministry of Tractor and Agricultural Machine Building
Diesel engines, diesel generators, machines, and equipment for mechanizing track work, conveyors, materials handling machines and equipment, operating diesel-locomotive models	USSR Ministry of Heavy and Transport Machine Building
Pumps, refrigeration plants, turbocompressors	USSR Ministry of Chemical and Petroleum Machine Building
Household video tape recorders	USSR Ministry of the Electronics Industry
Electrical apparatus, electrical equipment	USSR Ministry of the Electrical Equipment Industry
Power equipment	USSR Ministry of Power Machine Building
Software for personal and household computers	USSR State Committee for Computer Technology and Information Science

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