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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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INDUSTRY PLANNING AND ECONOMICS

KIRGIZIA'S MACHINE TOOL INDUSTRY TASKS, PROBLEMS OUTLINED

Frunze SOVETSKAYA KIRGIZIYA in Russian 29 Jun 86 p 2

[Article by L. Dvornikov, KiSSR Academy of Sciences member-correspondent under "A Scientist's Opinion" rubric: "The Final Result Is Important: How to Increase the Return on Scientific Exploration in the Machine Tool Industry"]

[Text] The program advanced by the party to accelerate scientific and technical progress places tremendous and demanding tasks before science. And the demands for a return on scientific research are, today as never before, specific: during this current five-year plan period no less that two-thirds of the increase in labor productivity must be obtained by using the achievements of science and technology.

The resolution of this problem requires first of all that all scientific forces be united, i.e. those of the academies, the vuz's and the sectors. First of all we need to make use of existing accumulated knowledge and experience which could be quickly brought to fruition in practice. Second, it is obvious that the specific problems associated with production ought to be given over to our various scientific collectives to be solved. And third, conditions favorable to exploration and research work, including basic work capable of producing new scientific results, ought to be set up.

Machine tool building is being given a special niche in the present economy. This was emphasized anew by CPSU Central Committee General Secretary M. S. Gorbachev at the June 1986 CPSU Central Committee Plenum. Meanwhile here in the republic, even though we have a complete machine tool building complex, there is still no justification for our massive manual labor expenditures, for our low productivity, and for the practical absence of any sort of organizationally ordered breakdowns vis-a-vis the problems of machine science or machine tool building in general. There exist no such departments or institutions in our republican academy, nor attached to our plants, nor even in our vuz's. This situation must not be thought of as normal, all the more since progress in the machine tool industry can be achieved only by introducing new and the latest manufacturing methods, through the use of flexible readjustable systems, industrial robots and automatic manipulators, computer aided design etc. That is to say, the kinds of measures which require profound scientific comprehension and a high degree of scientific erudition. The organization of the Institute of Machine Science which is attached to the KiSSR Academy of Sciences and the inclusion of its field of interest in the plans of the Department of Machine

Building, Mechanics and Control Processes Problems could make up for existing deficiencies and would make it possible to open new vistas for the development of machine building during upcoming five-year plan periods.

Knowing as we do that the resolution of the problem of organizing a new academic institute demands serious substantiation and a great deal of time, it would be a goodidea even now to aim at a temporary resolution--to open a scientific and technical institute for the problems of machine-tool building and attach it to the Frunze Polytechnical Institute, even if on a public basis, since there is where the primary machine-tool building specialists are concentrated at present. It could subsist on funds from economic agreements concluded by the FPI [Frunze Polytechnical Institute] with the machine tool-building enterprises of Frunze and of the republic as a whole. The degree to which the personnel of each specific enterprise are trained plays a leading role in the introduction of all the innovations which determine the level of intensification of production in the machine tool building industry. Time limitations require that we place special emphasis on retraining and raising the skill levels of our engineering corps. For this we need constantly ongoing courses of instruction with education program specialists. The official documents regarding the conclusion of these courses should be published.

On the other hand, in-depth scientific investigations are only within the power of those more powerful creative collectives which are united by this crucial goal, and which have their own leaders. A scientist is not in fact made merely by writing a dissertation. Occasionally, working one on one with his supervisor, the graduate student narrows his field down to his specialized, albeit scientific, interests. This is why it is so important, considering the tasks now facing us, to determine the subjects in which our future candidates and doctors of science will be trained.

Present-day scientific research requires, along with everything else, laboratories equipped with the latest powerful scientific equipment capable of producing results which really meet the requirements of scientific and technical progress. Admittedly, many of the academy laboratories as well as those in KiSSR Minvuz [Ministry of Higher and Specialized Education] are poorly equipped and do not meet present day needs and objectively speaking are therefore unable to produce outstanding results. Clearly, progressive scientific trends should be given substantial material support. There should be no two opinions concerning this.

Up to now, the practice of bringing in outstanding specialists to work as permanent scientific consultants to our industrial enterprises has been little used. Meetings of plant scientific and technical councils, new developments and the adoption of resolutiions, often strategic, are often carried out without the participation of those scientists who have broader and deeper knowledge of the essence of this or that problem.

Also we would do well to be thinking of those things which will work in the 13th, the 14th and successive five-year plan periods as well as in the beginning of the 21st century. The practice of recent years has shown that the influx of young people into vuz's for the machine-tool building profession is on the wane,

something which is causing serious concern. In order to change this situation for the better, we need to work out ways and means by which to attract schoolchildren from the fifth through the tenth grades to scientific study groups, to get them interested in problems, particularly those of machine tool building, and to train them to be future graduates of their secondary schools. This problem is beyond the scope of competence of vice-chancellors' offices, and ought also to be found within the field of vision on national education workers.

Moreover, the materials which deal with the results of scientific research and the practical introduction of latest scientific achievements by our leading enterprises are not published promptly or completely enough. In our republic these publications appear either in collections of vuz works which often are issued in small print runs which don't get to the enterprises, or in the KiSSR Academy of Sciences News, where articles concerned with all the problems being solved by the academy are printed, from those of medicine to animal husbandry. KirgizINTI [Kirgiz Scientific and Technical Information Institute] publications are mostly descriptive and cannot be used in practice. It is well worth considering setting up the periodical publication of a collection of works on machine tool building right here in the republic.

The suggestions made here undoubtedly do not settle all the problems, but their resolution could help to promote the improvement of the republic's machine tool building complex.

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INDUSTRY PLANNING AND ECONOMICS

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MACHINE TOOL METAL CONTENT REDUCTIONS DISCUSSED

Moscow MASHINOSTROITEL in Russian No 5, May 86

[Excerpts from article by A. B. Yevstafyev, deputy chairman of the Belorussian Republic Board of NTOmashprom (Scientific and Technical Society of the Machine-Building Industry): "The Potential for Reducing the Quantity of Metal Used in Our Products"]

[Excerpts] Belorussian machine-building industries are putting forth a great deal of effort to economize on material and power resources. This is making it possible to speed up and increase production volume without increasing our consumption of fuel, electric power, metal and other materials.

The republic's own Scientific and Technical Society of the Machine-Building Industry is making a definite contribution toward solving this problem. The republic's NTOmashprom board has held plenums during which inadequacies were uncovered in the operation of the primary NTO organizations, and where specific ways have been found to strengthen their efforts to solve their economic and economizing problems. New joint creative constructs have been set up. These take up the specific problems of raising the technical level of the products being manufactured.

Thanks to this effort definite results have been achieved in economizing materials and fuel-energy resources. Thus, a steady yearly saving of rolled ferrous metals--4 percent of the norm--has been achieved by the Minsk Motor Vehicle Plant during the last five-year plan period. In this connection, the system of material incentive which this plant uses as a reward for the economizing, as well as for the rational and thrifty use of ferrous metals, has been strengthened. The putting into effect of the obligations included in the individual economizing records of the creative integrated brigades has made it possible for the plant to fulfill its assignments for savings in materials and to reduce the weight of the MAZ-5335 by 146 kg, the MAZ-5549 and MAZ-509A by 160 kg and to increase total production volumes with no concomitant increase in ferrous metals requirements. With council assistance, the GPZ-11 [State Bearing Plant] NTO introduced 1,325 measures into its manufacturing system during the 4th and 5th year of the five-year plan. The plant derived an economic effect of over R6 million. The measures include metal-saving and waste-free production methods (powder metallurgy, precision die forging, cold extrusion and rolling, and the replacement of metal with plastic), as well as the introduction of more advanced production equipment.

In the forge shop, innovators working with NTO members introduced an automatic stamping line which saved a great deal of metal. Using the former method of manufacturing rings out of blanks, the core and over half the blank metal were cut out and went into the shavings. Now, the metal blank is stretched into a ring under tremendous pressure and no waste is formed. This way the lathe operator has to do nothing.

The manufacturing section of the GPZ-11 NTO council continues to search for new ways to save metal. It is well known that when parts are being ground metal is removed from them in the form of dust. Now this dust is collected, processed and used a second time in the production of Cardan bearings. They are now being produced with no waste.

Belorussian tractor manufacturers successfully fulfilled their plan assignments for the five-year plan period as well as additional socialist obligations. In 1985 their above-plan increase in labor productivity came to two percent, the prime cost for their products was reduced an additional 0.4 percent, and here, the whole of the increase in their output of products was achieved with no increase in the rolled metal demand. And the credit for this accomplishment goes to all the members of NTOmashprom's primary organization. With the most direct participation of the NTO council, the sections and other creative associations reviewed one third of the quota for material resources consumption, which resulted in the quota for rolling of ferrous metals being reduced by 11 percent at a plan assignment of 3.9 percent.

Members of the NTOmashprom Association council's design section took an active part in devising extremely powerful tractors. They are the ones who perfected the design for the rear drive axle assemblies for the MTZ-142 tractor, thus improving its reliability and expanded its technical and operational potentialities. The changes made in the design of the radiator saved three kg of non-ferrous metal for each tractor.

The primary organization is made up of 39 common NOT bureaus, which do a great deal of work introducing type designs for the scientific organization of labor, brigade forms of labor organization and their engineering support, multiple-machine servicing as well as advanced labor methods. All of this reinforces the routine of economy and thrift. Thus, during an assessment of work stations in 1985, 147 work stations were freed along with 188 workers, and 20 units of equipment were put up for sale. All this effected a saving of R203,800. Thirty-seven common economic analysis bureaus actively work in the NTO primary organization. From introducing their own suggestions for measures to improve parts manufacturing methods and a system of planning and accounting, they saved R201,500, 158,600 tons of rolled metal stock, 463,000 kW·hours of electric power and 11 tons of standard fuel.

The NTOmashprom primary organization council and the common creative associations at the Minsk Motor Vehicle Plant also give a great deal of attention to the problem of saving metal. All this made it possible for the enterprise to save over 9,000 tons of ferrous rolled metal and to reduce their demand for metal by 26.5 percent during the last five-year plan period.

The republic's machine tool manufacturers contribute greatly to the saving of material and power resources. The NTO council of the Minsk Production Association for the Manufacture of Broaching Machines imeni S. M. Kirov participated in the development of a prospective plan of measures for reducing the weight of each machine an average of 400-500 kg. To solve this complex problem, the designers chose to redistribute the metal making up the machine, concentrating its basic mass in those parts bearing the greatest load during the broaching operation. The remaining part of the bedplates is made of curved-profile sheet metal. The change in configuration greatly reduces the weight of the fixed bedplates on these machines. Instead of cast housing sections welded structures have been used, and this has reduced the mass of each part. The second method for saving metal was to introduce advanced manufacturing methods. Thus, instead of using several elements having complicated shapes in the machines, elements with rectilinear forms were used, and this allowed metal of up to 30 mm thickness to be cut on the guillotine shears, allowed the use of semiautomatic plasma cutting, blanking dies etc. As a result, the use of capacity for the metal was raised from 0.73 to 0.76. At the same time some 10 to 15 of each machine's metal parts (covers, hoods and flanges) were replaced with plastic. Work is also underway to provide maximal rigidity, improved standards for precision and reliability.

During the years of the last five-year plan period at the Minsk Machine Tool-Building Plant imeni S. M. Kirov, the active participation of scientific and technical societies helped to introduce 34 inventions and 1,050 efficiency recommendations into the production process. As a result 684 t of metal and 452,000 kW·hours of electric power were saved, labor-intensiveness was reduced by 198,000 norm-hours and R5.7 million were saved.

The NTO council of the Belorussian Powder Metallurgy NPO [Scientific Production Association] and the republican section are working on the introduction of waste-free manufacturing methods. As a result of carrying out the republic's goal-oriented integrated program "Powder Metallurgy" about 380 t of metal, 9,500 t of standard fuel and 19.5 million kW·hours of electric power were saved during four years of the five-year plan period.

The close collaboration of enterprise collectives in the city of Gomel with the republic's academic republics established the favorable basis for the formation of the organized NPO known as AGNOM (Academy of Sciences--Gomel Machine Building Enterprises). This made it possible for the scientists and production workers to focus their efforts on solving pressing scientific and technical problems and, first of all to raise the technical level of the products being manufactured and to reduce the amount of metal used in each of them.

With the direct participation of the Institute's NTO council into the problems of the machines' reliability and durability, the BSSR Academy of Sciences and sections from the republic developed a method of making predictions about the products manufactured by the machine builders at the planning stage, cedure for making diagnostic recommendations and for increasing the resistance to wear of the assemblies which are subject to friction. The introduction of these predictions and recommendations helps the enterprises to economize on material and power resources. Thus the device for heat treating localized

areas of crankshafts using the new manufacturing procedure developed in the institute and introduced in the Minsk Motor Works increased their fatigue strength up to 40 percent.

The production of industrial products of a high technical level in the absence of painstaking quality and reliablility checks and without making technical diagnoses. This is precisely the sort of effort underway in the Belorussian Polytechnical Institute. With the active creative participation of the institute's scientific and technical membership and the republican ultrasound section a high information content videomonitor was developed and introduced which allows one to peer into the depths of metal, to see its structure, evaluate its reliability, detect defects and to evaluate its operational suitability. The introduction at Leningrad's "Russian Diesel" diesel plant of a magnetic flaw detector which was developed by scientists from the Belorussian Polytechnical Institute made possible the flawless detection of metal fatigue and cracks in ship engines. The economic effect derived from the adoption of the new flaw detector amounted to over R1 million.

It might be well to point out that during the last five-year plan period there was a considerable increase in the contribution made to industry by sectorial plant scientists. At the Grodno Cardan Valve Plant worn out dies were thrown out as scrap and new ones were cut out from blanks, almost a fifth of which turned into metal shavings. The scientific and technical membership of Minavtoprom's MKTEI [not further identified] and the members of the republican foundry unit devised a section for the remelting of dies in the plant, where worn-out dies are remelted in two coreless induction furnaces. This is how waste-free production was set up. Using the united creative efforts of scientists from Belorussia, the Ukraine, Leningrad and Moscow, polymeric materials research is now in progress.

The BSSR Academy of Sciences' Institute of Metal-Containing Polymer Systems is playing a leading role in this work. The combining of polymers with metals, wood and silicates has made it possible to devise structural materials here having high friction- and corrosion-resistant properties. Thanks to the active participation of the Gomel NTOmashprom board and the institute's primary organization, several sectorial enterprises introduced new composite materials. These materials increased the service life of machine assemblies from 1.5- to 3-fold, and reduced the labor-intensiveness of the manufacturing process thanks to the rational use of scarce materials. In addition, they effected a yearly saving of R2.5 million.

The scientific and technical members of the Vitebsk SKB [Special Design Bureau] for Gear-Machining, Grinding and Tool-and-Cutter Grinding Machines, as well as a number of the republic's machine tool-building plants have done experiments and experimental design operations aimed at devising new efficient methods for machining gears. These methods have been the basis for the creation of a whole gamut of automated machine tools which perform free of human operators. Production has increased 2-4-fold thanks to these automated machines, and the work force has been reduced by a factor of 5. The effect on the national economy derived from adopting these methods has exceeded R100 million.

The ultrasound unit of the republican NTOmashprom board working with similar units from the Minsk Tractor Plant imeni V. I. Lenin are at work on bringing ways to harden cutting tools into the manufacturing process. They also want to introduce pulsed ion-plasma application of wear-resistant coatings on "Bulat"-type installations. The durability of these products increased 2-fold after this procedure was introduced, and the economic effect derived from using two of these coating-application devices amounted to R83,000. The establishment within the tractor plant of a special-purpose section of 15 hardening devices will make it possible to harden the entire tool, and will thus greatly reduce consumption of these tools and will save scarce tool material.

A great deal of assistance was given to the Lidselmash Agricultural Machinery Plant imeni 60th Anniversary of the BSSR in Lida in setting up a split-pin rolling process by the republic's unit for mechanical working of metals. As a result, labor productivity increased 5-20-fold, metal consumption was reduced by 20-60 percent and tool outlays were reduced by a factor of from 5 to 10.

A creative brigade from the Institute of the Mechanics of Metal-Containing Polymer Systems of the BSSR Academy of Sciences, in fulfilling its common creative plan, analyzed the potential for replacing the bronze and cast iron drivetrain bushings as well as those of other assemblies in fertilizer spreading machines and replacing the bushings in Belarus tractors with bushings made of composite polymeric materials. This same brigade developed a working drawing for machine tool attachments to be used in the manufacture of a number of bushings and friction braces which were turned over to the clients for operational testing. The annual saving derived from implementing the measures contained in the creative plan amounted to over R500,000. A. M. Malevich, a member of the Baranovichi Machine Tool Accessories Plant NTO, introduced eight individual plan measures and effected a saving of R210,000. It was he who introduced pneumatic clamps and the idea of changing the design for the machine tool clamp housings with a manual drive, thus saving 77.6 t of metal and R26,000.

The republic's scientific and technical membership and the enterprise collectives continue to search for new organizational working methods which will economize on metal. One of these methods is that of certifying parts and assemblies with regard to their unit quantity of metal.

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INDUSTRY PLANNING AND ECONOMICS

GIANT CHEREPOVETS BLAST FURNACE NEARING COMPLETION

Moscow PRAVDA in Russian 20 Mar 86 p 1

[Article by Yu. Zhigaylov, Cherepovets, Vologda Oblast: "Lessons of a 'Northerner'"]

[Text] Furnacemen-Managers * Why Builders and Installers Had To "Patch Holes" * Electronically-Controlled Blast Furnace

A thin cloud of steam hovers above the 100-meter "samovar" of the No 5 Cherepovets blast furnace, which its builders affectionately called the "Northerner." The world's largest steel-smelting unit seems to be breathing, living, working. But it is, in fact, the refractory lining being dried by air heated to 600° that produces the white haze above the furnace. One senses in everyone here the anticipation of the long-awaited start-up. The furnacemen here have already become managers.

The "Northerner" is unusually large: 5,580 m^3 effective volume. That is larger than all three of the blast furnaces alongside it combined.

Or take the charging unit and bin trestle, whose purpose is to prepare, batch and "feed" the furnace, whose appetite, incidentally, is truly enormous: eight trainloads of charge a day. Whereas it used to be that more charge meant more slag, the "Northerner" is different from other blast furnaces in that respect as well. It will be the most ecologically clean furnace in the country: closed-loop water circulation will mean no wastes discharged into the rivers. Thousands of units of the very latest design will remove dust and scrub waste gases. Small particles will become new raw material, the gas will be used as fuel, and millions of tons of slag will become valuable building material. A nearly waste-free blast furnace production facility has been created.

The furnace automated control system is unequalled. It includes upwards of 3,000 very sophisticated devices, among them visual displays and telexes, microprocessor complexes and computers. It takes about 50 separate rooms to house all this equipment. It was developed by dozens of enterprises and organizations, led by the VNIPI [All-Union Research and Planning Institute] of Automation and Control Systems. L. Agafonov (Moscow, S. Balyk (Kharkov), O. Zabolotskiy (Yaroslavl), V. Safris (Dnepropetrovsk) and hundreds of leading specialists from organizations of the Ministry of Instrument Making, Automation

Equipment and Control Systems worked enthusiastically and creatively to introduce this innovation.

ASU chief designer L. Sulman and I enter the central control room. It is small, a third the size of those in the country's most modern blast furnaces. The flow of information into here from the various "Northerner" facilities is enormous. The metallurgists' electronic assistants have much to do: control the technological processes and warn of potentially dangerous situations, cost analysis of the operation of the units, and helping choose the best smelting parameters. These are the eyes and ears, the nervous system, of the blast furnace. It goes without saying that all this equipment is not cheap. Is it profitable? The electronic devices themselves provide the answer. By choosing optimum fuel proportions, for example, 120,000 carloads of coke a month will be saved, the annual economic impact expected to total about 200 million rubles.

Installation of this mighty furnace was a difficult test for construction workers. Many traditional approaches were not suitable here. New ones had to be sought, which was done from the very first day. Use of the very latest concrete pouring equipment helped in putting up the furnace itself ahead of schedule. "Cherepovetsstalkonstruktsii" installers continued rewriting the record books, using for the first time automatic welding units developed by Kiev scientists. Brigades led by V. Tikhankov, G. Vdovin and Ye. Valuyev installed furnace modules weighing nearly 400 tons which had been preassembled on the ground. Each such module raised the height of the blast furnace by a couple of meters. Local designers contributed by developing a special lift. "Soyuzteplostroy" refractory bricklayers worked efficiently, dressing it in a heat-resistant "jacket" ahead of schedule, even though it received some equipment late.

In a word, quite a bit of experience has been accumulated here. It will doubtless be useful in the future. But there were the inevitable serious disruptions, rush jobs, and quiet followed by frantic activity. In the past year and a half, nearly as much was spent as had been spent in all the years preceding. Strange as it may seem, the disruption was often introduced by the Ministry of Ferrous Metallurgy, which will run the blast furnace and which is interested in getting it on-stream as quickly as possible. Uneven project financing and interruptions in deliveries broke up the tempo achieved. The time lost was made up at great expense. The final months proved to be especially difficult. Each day, upwards of 600,000 rubles worth of work had to be done, an amount which was previously done over several days. These are also lessons that must not be disregarded, to avoid repeating them in the future.

The construction project's party headquarters, created on the initiative of the CPSU obkom, did a great deal of work in the decisive months. Vologda area enterprises sent their best representatives to the projects.

Now, the "Northerner" is ready to go on-stream. The equipment is being "cranked up" and the metallurgists will soon begin charging the furnace. The flame will buzz and the white-hot iron will pour from the hearth. Initially, the blast furnace will produce 3.5 million tons of metal a year; after additional facilities go on-line, that will increase by another million tons a year.

11052
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METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

DESIGN BUREAU ROLE, WAYS TO STREAMLINE METAL FORMING SHOPS

Moscow PRAVDA in Russian 21 Sep 86 p 2

[Article by A. Starukhin, PRAVDA correspondent: "Draft of an Order -- Party Life: Evaluation and Selection"]

> [Text] Voronezh--"Everyone knows what goes on there. They play chess." This is often said about design institute workers. You would be hard pressed to find a single chess board now at the State Design Engineering Institute for Forging and Pressing Machine Building (GPTIKuzmash).

Where three years ago there were 1200 employees at the institute and its prototype production facility, now there are 937. While the previous salary fund remained unchanged, salaries were going up and efforts were being made to interest designers in the bottom line.

"However, if we are talking about reorganization in its fullest sense, only the very first steps have been taken and the fundamental tasks still seem to lay before our party group and the entire party organization at the institute." These were the words of V. Kirillov in his report to the party organization's evaluation/selection meeting of communists in the office of senior design engineers. The institute has 219 party members and 29 party groups. The senior design engineer party group is one of the most important: most of the daily events and problems at the State Design Engineering Institute for Forging and Pressing Machine Construction (GPTIKuzmash) can be seen in the light of its concerns and actions.

By focusing on the most painful and urgent matters it seems the party group organization found the true tone of the overall discussion of the year and brought forth a frank and animated response from party group members. One after another, engineers A. Zherelin, T. Bugakov, the institute's deputy chief engineer E. Khoroshayev and others stepped forth to speak. All of them spoke with a feeling of great responsibility for the tasks entrusted to them.

The following overall picture emerged: GPTIKuzmash, controlled by the Ministry of the Machine Tool and Tool Building's central board for forging and pressing equipment, is one of the sector's main research centers and directly affects the work of many associations and enterprises throughout the country. What

they produce today, how they produce it, their level of labor productivity, and what progressive changes will take place tomorrow all depend to a great extent on the activities of the teams of designers and engineers here in Voronezh.

For a long time the institute could be seen as consisting of two institutes: one which designed the "walls" of the shop of the future and another which designed things to fill the space between those walls. Both of these units had their own separate management and additional coordination was required where the two managements met. The first task taken up in reorganizing the institute was to merge both work streams in a single pair of hands. There was an immediate reduction in conflicting claims and the responsibility for proper task performance rose. The merger took place under the vigilant surveillance of the party committee, but it was a special credit to the senior design engineers' party group since its members were the initiators and active executives of the new system.

Under the reorganization a two-fold acceleration of the work of designers and technicians was required while maintaining close cooperation. This caused a need for more work mobility at the workstations, something a little alien to their nature. In fact, new construction is increasingly taking the place of reconstruction. The pace of scientific and technical progress must increase significantly.

This was the primary thought of the participants in the evaluation/selection meeting. One curious fact in particular was raised: Kirillov flew to Barnaul 11 times in one year and spent a total of 117 days there. Why did he have to "order" himself to the Altai? "I was still a junior designer when the Barnaul mechanical press plant began to expand almost 20 years ago," he recalled. "As of the latest plan they have completely revised everything four times since then. Just imagine, they were starting from scratch. The main reason for this: long-term construction."

This is one facet of the problem: protracted construction. How can each enterprise be equipped with technology that will meet not only today's requirements but those of 1990? Pondering this in greater depth, the communists came to the conclusion that they must begin with themselves, with an increase in the quality of designs. But there is another aspect on which much depends: the associated organizations.

At the party group evaluation/selection meeting institute director V. Zolotov (himself a member of the senior design engineer group) reported to the communists that the set of suggestions related to the acceleration of scientific and progress sent to G. Trachuk, chief engineer of the central board, during the middle of March have, unfortunately, not yet been answered. Has this cooled the enthusiasm of GPTIKuzmash communists? No. They have taken upon themselves the job of drafting an order from the Minister of Machine Tool and Tool Building directed toward increasing the responsibility of associated organizations for mutual activities, and toward more strictly defining the roles of these organizations. Without an immediate solution to these problems, the institute believes that it is difficult to count on an effective reorganization.

Here is what, more than anything else, spurred the party members to act in just this direction. Newly designed enterprises and those undergoing radical reconstruction must be 1-1/2 to 2 times more productive than existing ones. This is the concern of designers and scientists. The main Experimental Scientific Research Institute for Forging and Pressing Machine Building (ENIKMash), also located in Voronezh, is working with GPTIKuzmash on one such project. It seems it is being called upon to participate in a fundamental improvement of production equipment. Yes, this is how it should be and this is how it must become according to the draft of the Minister's order prepared by GPTIKuzmash communists. So far, however, the situation appears to be different.

For example, the Leninakan plant and the machine tool builders of Azerbaijan continue to produce obsolete models of unreliable systems. The five-year plan of the Kuzrobot institute in Taganrogsk "contemplates" the development of manipulators and the Voronezh machine tool building plant is offering milling machines whose quality is undistinguished. Now, the main ENIKMash is proposing equipment with productivity, weight and other parameters significantly inferior to models offered around the world. These types of designs would not reflect expertise. However, there seems to be a loophole even here: what are being proposed are "promissory notes", i.e. the "raw" characteristics of new and as yet non-existent machines and mechanisms, and in many cases no one is even guaranteeing they will see the light of day.

The party group communists also came out against these "promissory notes" in their draft of the Minister's order. In other words they are against "blue sky" designs. Of course, something must be proposed in exchange.

"We tried to precisely define the scope of our duties and the obligation of associated organizations," said party group organization deputy and chief design engineer A. Zherelin. "In particular, ENIKMash is required to conduct continuous development work on design projects for special production equipment with a five-year plan perspective. Are there new problems, concerns and extra work with neighboring organizations in the development chain? Of course. However, we do not see another approach: we all have to commit ourselves to mutual responsibility. We hope the Ministry will support our initiative."

It is not by accident that one of the participants in the meeting called the senior design engineers the coordinators of the entire collective's efforts. Actually, all departments and subunits are under their eyes and thus they can competently analyze the status of subsectors and even sectors.

"It makes no difference to us as long as the enterprises we design produce their rated output and operate in a stable manner," reflected Yu. Dudchenko. "Even material rewards for designers depend on this. However, there is professional satisfaction in that you are performing a task that is very useful and needed by the public. For each of us it is a matter of an outstanding design and an excellent factory of the future. At the same time, frankly speaking, there are tendencies which lower design quality and delay progress."

According to specialists, one of these is most alarming: the creation of "all-knowing" and "all-capable" multi-item production enterprises. During this five-year plan a plant is coming on line in Chimkent. About 1600 machines of 80 types were required to equip this facility. The next step is for everything to be taken care of there, even down to the brooms for sweeping shop floors. What is the result of this direct negation of specialization and cooperation? Low output, obviously. The paradoxical absurdity of the Chimkent "natural system" model is threatening. A forging and pressing machine factory in Salsk has been in business for a quarter of a century producing one machine in three sizes. Evaluating it in the light of mean sector production levels we can see that it is on the borderline -- for 1990! Its all-powerful southern "sister facility" is already behind at this minute.

The communists did not refrain from posing questions that they would very much like to have proposed for consideration by sector management as well. Today, according to the party group members, there are, and can be, no "little" people in the tough stages of reorganization. Each person is obligated to think of the larger picture, or in terms of the state. The level of self-criticism at the meeting confirms this thinking.

"We have finally become seriously concerned with personnel matters," indicated E. Khoroshayev. "We have initiated a competitive system for filling vacant positions. A future immediately opened up for young people, indeed I would say that positive enthusiasm for work appeared. At the party committee's initiative many of us participated in the development of an 'enterprise standard', but now we must return to it. The document produced is unwieldy."

The "standard" is a set of indicators and a method for evaluating and stimulating quality engineering work in all the institute's subunits. You will receive the highest salary bonuses if you have brought new technical solutions and innovation to a design, registered a patent for your own innovation, been awarded honors or prizes for participation at exhibitions, reviews or competitions, used computer-generated calculations in a design, reduced labor costs, or participated in the introduction of scientific and technical achievements or the communication of state-of-the-art experience. All of these factors are evaluated in numeric terms and the deserving are rewarded with rubles. The concern of participants at the meeting that the new system should be improved and that the entrance of formalism should be avoided is understandable.

The communists discussed yet other resources for improving work. For example, participation and the graphic nature of competition must be increased. Mutual demand must be increased.

N. Romanovskiy summarized the results of the party group members' meeting. Shortcomings and resources are the subject of primary attention. We must take them up ourselves. It is noted that the party group acts in conjunction with the party committee and that any negative effect in the sector is of concern to them. This is a party initiative and a task to be undertaken with enthusiasm. It is important that this initiative be noted at the Ministry. Its order, the draft of which was written at the "grass root" level, is to be observed.

12746
CSO: 1823/13

METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

UDC 621.31:621.97:(049.3)

BOOK ON DESIGN, EXPLOITATION OF METAL-CUTTING MACHINE TOOLS

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 7, Jul 86, pp. 43-44

[Review of book by Ya. B. Rozman and B. Z. Breyter "Ustroystvo, naladka i ekspluatatsiya metallorezhushchikh stankov" (The Design, Set-up and Operation of Metal-Cutting Lathes), Mashinostroyeniye, Moscow, 1985, 208 p.]

[Text] Systems regulating the speed of the electric motors operating machine tools have often been examined in various books and manuals. However, it is difficult to find such material as presents sufficiently complete technical and design data on the various electric drives which have recently been equipped with every kind of static transformer (feeding device) to enable regulation of the motor speed within the ranges specified for specific technological processes.

The appearance of the present book on the market should somewhat facilitate the operation of machine tools equipped with the various models of Soviet adjustable electric drives. It has a rather large publication (20,000 copies), enabling the broad group of machinists who must deal with adjustable electric drives in one way or another in their work to familiarize themselves with the contents of the book.

This book is primarily intended for the lathe attendant and the set-up worker, although it will undoubtedly be of interest to those with greater training, including the technician and the engineer, since it affords the opportunity of familiarizing oneself with current trends in the field of adjustable electric drives when designing machine tools or other machines or mechanisms, and of properly selecting such drives for particular mechanical engineering subjects.

Given the relatively small volume of the book (13 conditionally full pages), the authors naturally could not describe in detail all the previously manufactured (but still in use) and presently manufactured electric drives. However, the information on electric drives which is given in the book is useful, since the fact of its compilation in a single source should assist the reader in familiarizing himself with this subject. The 12 tables in the book, containing the specifications on several electric motors, frequency converters, and primary motion electric drive units, the installation indexes of adjustable

electric drives and converters, and other information, along with 85 illustrations, exhibiting the structural, functional and schematic electric diagrams of the various transformers and regulators used to change the speed of rotation of electric motors, will also be helpful to the reader.

The recommended literature cited (15 titles) will help the reader better familiarize himself with the topics examined in the book.

The material presented by the authors can be divided into three parts. The first (first four sections) provides general information on the electric drives and the electric motors and dc transformers used in them, and also touches on questions of automatic control and regulation of electric drives. The second part (next four sections) describes adjustable dc and ac drives of the common industrial series, electric drives for universal lathes, NC lathes, and lathes with discrete and gate-operated motors. The third part of the book (last two sections) examines the operation of dc and ac drives.

Let us examine the contents of the book in greater detail, as well as certain of its mistakes and inadequacies which have come to our attention.

In the first part of the book, the authors give a classification of electric drives, describe the methods of regulation of the frequency of rotation of motors, and present the basic characteristics of adjustable electric drives: the range of regulation of the rotational frequency; the torque; the stiffness of the mechanical characteristics; the uncertainty of load and heating; the nonuniformity of rotation; the nonsymmetrical reversal; the efficiency and power factor; the dynamic characteristics, reliability, dimensions and weight. Also given here are the basic formulas relating the rotational speed of a dc motor to the voltage, amplitude of current, and magnetic flux. The influence of pulsating current on the characteristics of such motors is considered and concise information on special motors (low-inertia motors with hollow or disk armatures and with permanent magnets, and discrete or stepping motors) used in NC lathes is presented.

In the description of induction motors of electric lathe drives, the authors dwell on their mechanical characteristic in various operating duties: acting as a motor; acting as a generator; plugging (braking). Brief information is presented on the basic series of such motors (series 4A) produced by Soviet industry.

Basic information is given on the transformers used in dc drives (thyristorized, transistorized), pointing out their merits and deficiencies; the layouts and properties of the thyristors, the operation of controllable rectifiers, and methods of protecting the transformers against current surge and emergency conditions are described, and rectification layouts are given.

Discussing automatic control and regulation of electric drives, the authors turn their attention to the control instructions (regulation of rotational speed, starting, reversal, braking and certain other operations), the opera-

tion of automatic regulation systems (SAR) with and without feedback, current clipping, typical operating duties of various adjustable electric drives (motor-type, plugging-type) in the four quadrants of the mechanical characteristics of the drives, as well as their dynamic characteristics, which govern the quality of the automatic regulation system. This information is presented in a rather popularized form, enabling its use by those with little grounding in electronic and semiconductor engineering.... [end of text submitted for translation]

12717
CSO: 1823/322

OTHER METALWORKING EQUIPMENT

UDC 658.52.011.56.012.3
621.98.06

FOREIGN FORGE-AND-PRESS MACHINE TOOLS, THEIR FMS UTILITY DISCUSSED

Moscow MASHINOSTROITEL in Russian No 4, Apr 86 pp 10-11

[Article by V.L. Lishayev and V.P. Duranin, engineers: "Sheet-Forming FMS Equipment"]

[Text] In the fabrication of parts made from rolled sheet stock, an increase in the flexibility factor of an FMS [flexible machine system]--one of its principal indicators--is achieved because of the following: the employment of equipment having NC [numerical control]; an increase in the number of operations performed on a single machine; the development of sheetworking systems based on equipment having NC and robotic systems based on crank presses; and automation of the changing of press tools in presses, the location and spacing of blanks on the material, and the design of press tools.

An analysis of production equipment being produced in industrially developed countries shows that an extensive product range of forge-and-press equipment having NC for working sheet materials is being produced at the present time, such as: inclined throat shears, bending presses, roller bending machines, turret blanking presses, profile-iron bending machines, roller shears, spinning lathes, etc. NC systems are used in this equipment either for controlling the production process through the machine's kinematics (downcut shears, sheet-bending presses, roller sheet-bending machines and inclined throat shears) or through the tool (turret presses).

Great opportunities for increasing the flexibility of a production process are created by equipment which makes it possible to perform several different production-process operations, which shortens ancillary time and lowers the cost of transporting and storage. Able to serve as an example of such equipment are turret presses, which have become widely used and are designed for making parts of the panel type having holes of various shapes and sizes.

Presses from the Behrens firm (FRG) which have an NC system have a turret furnished with a magazine for 18 or 24 tools, as well as a cutting device, a plasma or laser head, automated positioning of sheet stock, and automatic tool changing and stock ejection.

The heads for plasma-arc or laser cutting are used for making holes of complex shape, as well as an outside contour if it is not a straight line and

cannot (because of its complexity) be made by cutting out. The speed of plasma-arc cutting with a plate thickness of 8 and 20 mm is 4.5 and 1.8 m/min, and of laser cutting with a plate thickness of 1.6 and 8 mm, 3.5 and 0.7 m/min, respectively.

In similar presses made by the Trumpf Machine Tools firm (Great Britain), tool changing is performed automatically or semi-automatically in 6 to 12 s. The diameter of holes which can be made with a plate thickness of 6 mm is 6 to 100 mm. Information is entered either manually by means of a keyboard, or from punched tape or from a magnetic cassette.

The Hondaille (USA), Nisshin and Amada (Japan) and Raskin (Switzerland) firms also make turret presses. As a rule, so-called sheetworking centers are formed on their basis. The supplying of these centers with automated transport equipment for feeding the sheet and removing parts and waste makes it possible to complete the production routine practically without the participation of operating personnel over the course of an entire shift. Sheetworking centers are formed also on the basis of inclined throat shears and bending presses furnished with NC systems.

The sheetworking center from the LVD firm (Belgium) contains shears, a loading system, a feeder and a unit for unloading and packing. Sheets are fed piece by piece by means of an NC-furnished feeder to the table of the shears and are set up precisely. A built-in rotating table ensures proper positioning of the sheet when cutting it into blanks and trimming its edges. The NC system makes it possible to change the inclination of the blades and the clearance between them. Cut blanks are fed by means of a transporting device to a packer, and the various positions of the packer program feeding of the container. An NC system designed according to the hierarchy principle is used for controlling the center in eight coordinates. Interaction between the operator and control system is monitored on a display.

The sheetworking center for cutting rolled sheet stock made by the Fasti-Werk firm (FRG) has inclined throat shears and, placed before them, vacuum lifting and transporting units. Sheets are centered on the shears' table by means of special units having a pneumatic drive. A jigging unit packs and sorts blanks. Data (sheet thickness, the material's σ_v [ultimate strength], and the length of the cut) are entered into the NC system in the interactive mode or by means of cassettes. The control system includes a monitor and a display.

The sheetworking center from the Reihardt firm (FRG) is furnished with a robot for feeding the sheet to the shears' table and makes it possible to cut sheets lengthwise and across. Parameters such as the position of the back stops and the number of blanks to be cut are entered into the NC system. After cutting, blanks measuring less than 200 mm enter a container via a sorting unit, and large blanks are fed to a truck with a pallet.

The cutting process, beginning with removal of the sheets from the stack and ending with the packing of cut blanks into a container, is totally automated in the model KON-2 automatic system designed by the Kharkov NIIAP [Scientific Research Institute of Production Automation].

It is possible to automate large-scale production because of the introduction of progressive dies or multiposition presses having built-in transport units, the cost of which is lower than that of robots. On the other hand, it is feasible to use industrial robots with a wide range of parts and a short production routine, when transport equipment is unprofitable because of its poor flexibility. In addition, robots are used in those cases when several presses can be attended to by a smaller number of workers; as well as in single-operation machining; with the presence of single-operation dies; with parts of considerable overall size, when they cannot be made on a multi-position press; and with the employment of a single-operation die making it possible to increase the metal utilization factor.

In connection with the fact that general-purpose robots are not suitable for working with sheet-bending presses (because of the complexity of the work-pieces's motion in bending), special robots have been developed for this equipment. It should be mentioned that these robots work in conjunction with inclined throat shears for feeding and orienting the sheet on the shears' table. Hourly labor productivity can be lower when a robot is used than before its introduction, but the shift productivity will be higher.

The development of flexible machine systems is impossible without the automation of die changing. This is explained by the fact that from 0.5 to 1 h is required at the present time to change dies of medium size, and the time required to change large dies reaches 4 h. The mechanization and automation of die changing are solved by changing the design of the press table, developing hydraulic and pneumatic clamping devices, and using systems for NC from a microprocessor.

A unit for rapid tool replacement on hydraulic presses makes it possible to change a die in 2 min and includes a hydraulic system for fastening dies, a system freely programmable from a microprocessor, racks for dies, and an automatic hoist on a carriage.

8831
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OTHER METALWORKING EQUIPMENT

SUPERHARD CUTTING-TOOL MATERIAL 'KIBORIT' IN PRODUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian No 235, 11 Oct 86 p 2

[Article by V. Zenkovskiy, correspondent (Poltava)]

[Text] The first lot of a new superhard polycrystalline material, "kiborit," has been produced at the Poltava Diamond-Tool and Artificial-Diamond Plant. This material can be used for machining extra-hard machine parts by the method of turning instead of grinding. Labor productivity is increased by several times, and the performance of products is improved simultaneously. Tools with cutting edges made of kiborit are equal in quality to the best world models of similar classes.

Kiborit was developed at the Ukrainian Academy of Sciences' Institute of Superhard Materials.

FTD/SNAP
/9365
CSO: 1823/46

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

UDC 001.89:621:658.382.3:061.43

SCIENCE-ENGINEERING-PRODUCTION-86 EXPOSITION

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 7, Jul 86, pp 23-27

[Article by Ye. T. Larina and O. N. Lutovinina under the "At the VDNKh SSSR" rubric]

[Text] The exposition entitled "Science-Engineering-Production-86" (NTP-86) was opened on the eve of the 27th Congress of the CPSU and is a continuation of the highly successful exposition "Science-Technical Progress-85".

The centerpiece, as formerly, is the dissemination of scientific and technical progress. The broad palette of the exposition underscores the urgent task framed in the "Basic Trends of Economic and Social Development of the USSR for the Years 1986-1990 and the Term Up to the Year 2000": "The ultimate goal of the economic strategy of the party has been and continues to be the inexorable raising of the material and cultural standard of living of the people. The realization of this goal in the coming years requires an acceleration of the socioeconomic development, a comprehensive intensification and raising of the effectiveness of production on the basis of scientific and technical progress."

The exposition displayed all the elements linking together science, engineering and production, and provided a complete picture of the conditions under which everything that is new and progressive is being realized more quickly and better in industry.

More than 80 ministries and agencies, the USSR Academy of Science and the academies of the Union republics, the scientific-technical societies, research institutes, design bureaus, and more than 800 scientific production associations and enterprises displayed above 2000 exhibits in 19 sections. Here one may familiarize himself with modern technology--from the interplanetary station Vega to the high school microcomputer, a segment of an automated factory, robots used in various sectors of the economy, and the program of extensive socioeconomic transformations.

The exposition devotes much attention to automated systems and computer technology.

The ARM2-01 problem-oriented complex of automated graphic design work stations is intended for computer-aided design chores, including interaction of several users with the computer, manipulation and editing of graphic information, as well as interaction with a senior computer of the YeS type. ARM2-01 allows operation of two types of work station: one based on a data preparation and input terminal for large arrays of graphic information, and one for editing and formulation of directives for implementation of the functional programs. ARM2-01 affords the possibility of coding, designing, depiction on a terminal console and editing of rather complicated objects.

A system for computer-aided design and outfitting of the set-up of automated lathes (SAPR "ARATON"), based on the ARM2-01, is being used to lay out the set-up of single-spindle automated lathes and to produce control programs for the fabrication of cams on NC lathes. The operational plan formulated by the technologist is fed into the system, which prints out an operational chart for the technological process. The processing time for a set of documents for a single set-up is reduced by a factor of 8-9, while the time of fabrication of the cams is reduced by a factor of 4-5. The system encompasses a wide assortment of models of Soviet and Western single-spindle automated turret and lengthwise lathes and enables an independent operation of the individual subsystems.

The SAPR "Avtoshtamp" is designed to produce a set of technical documents for the fabrication of shearing dies. It includes subsystems for input and checking of original data, design of the technological processes of the stamping, design and drafting of the dies and the required blueprints, design of the technological processes of fabrication of parts of the dies and production of control programs for their fabrication on NC machine tools.

The system designs 17 types of shearing die. Its productivity, computed in accordance with the throughput capacity of YeS computers, amounts to an average of 6000 designs per year for a three-shift operation.

The RMOT-02 subcomplex of video terminals for outfitting of process engineer work stations is used in complex ASU TP [automated process control systems] in the chemical, petrochemical, metallurgical, power engineering and other sectors of industry. The complex possesses expanded capabilities, improved picture quality on the screen, and better reliability than the previously developed RMOT-01.

The ARM2-05 problem-oriented complex of automated work stations for programming of microprocessors is used in systems of computer-aided design of programmable digital hardware, particularly built-in microprocessors (MPU). The primary area of application of the complex is the automation of design

of programmable (microprogrammable) digital hardware constructed on the basis of microprocessor techniques. Its distinguishing feature is the ability of the user to work in two modes: first, in development of application programs adapting the complex to the design of specific (target) MPU; second, in the programming and debugging of the target MPU.

The problem of selection of hardware for organization of a single-level or the lower link of a multilevel automated process control system can be solved by the SM1634.15-SM1634.18 control computer complexes. The primary application of the computer complexes is as computer terminals for linkage to an object (TVSO-1).

The TVSO-1 is built according to order in a modification complying with the requirements of the automated object and the range of problems to be solved in the ASU TP. The hardware and software of the TVSO-1 are oriented toward the following functions: gathering of information of analog and discrete signals from sensors, including sensors hooked up to outlying converters and switchboards, in a definite sequence and at a definite rate; primary and intensified processing of metering results by standard and special algorithms; indication at the process engineer's console of metered values of the parameters by call of the operator, indication and changing of the range of monitoring; indication and recording of messages as to disturbances in the technological process; periodic printing of reports as to the operation of the object under control; sending of analog and digital signals to the object according to the results of the computations by the user programs; exchange of information with an upper-level computer complex.

TVSO-1 includes a model SM 50/60 processor. The set of instructions carried out by the processor includes both a basic set, dictated by the architecture of the SM 50/60, and a supplementary set of problem-oriented analog and digital information input/output instructions.

TVSO-1 is configured in accordance with the requirements of the client. It is manufactured by the supplier in the form of a finished article, and is programmed in high-level languages. It is compatible with computer complexes (VK) of architectures SM-1, SM-2, SM-2M, SM-1634. It has a quick information input/output and a large range in terms of the number of linkage channels of required type to the object.

The SM 1210.01 basic computer complex is intended for use in complex automated process control systems and in scientific experiment systems. In addition, it is used to construct data processing centers in queuing systems, in automated systems for processing the results of testing of intricate equipment, in computer networks, and so forth.

Usually, the complex includes two central processors and two input/output processors. All of these are connected together and have access to a shared

main memory of capacity 4 Mbyte. In the SM 1210 complexes, the functions of data processing and system control are separate. All the date processing is done in the central processors. The exchange of data between the hardware and the main memory occurs under control of the channel constituting a part of each input/output processor. At the same time, the channel may perform up to 16 different operations in the center-to-point, block-multiplex and multiplex modes.

The SM 1210 (SM-2M, PS-3000) may be used to construct local-area and regional distributed multiple-computer complexes.

The PS-3000 computer complex is intended for use in high-performance data processing systems. It has a unique architecture with equipment for addressing and processing of scalar and vector data.

The system includes several functionally specialized groups of processors and affords several methods of boosting the productivity. The PS-3000 complex has been used to build up regional geophysical computer complexes for thorough processing of seismic survey data at regional geophysical computer centers.

An important place among the displays of the exhibit has been set aside for the projects of the Scientific Production Association of Automated Control Systems "Moskva".

The complex of interlinked automated economic management systems Moskva (the complex ASU Moskva) is intended for modernization and automation of the processes of control of the economic and social development of the Moscow municipal economy as a whole through widespread use of economic-mathematical methods, computer technology, communications and office mechanization.

The complex ASU Moskva is a group of interlinked automated control systems--municipal, interdepartmental, regional, departmental ASU, ASU of enterprises and associations, ASU for process control, and so forth. The complex is being developed as a territorial link in a national system of information gathering and processing. Its foundation presupposes an interaction with the ASPR [automated control system for planning calculations] of the USSR Gosplan and other upper-level systems. The construction of the complex entails a modernization of the forms and methods of socioeconomic planning and management; organization of standardization and stimulation of the processes of production, management and control; development of hardware and techniques of automation of the processes of planning and control.

At every hierarchical level the complex affords an automated gathering, transmission, processing and analysis of information for decision-making by the appropriate administrative offices, as well as sending these decisions to the implementers and monitoring of their fulfillment.

During the first phase of its development, the complex of ASU will unify more than 500 automated control systems of the associations, enterprises and organizations of the Moscow municipal executive committee, where several hundred ASU for technological processes, around 30 scientific research and design ASU, more than 40 departmental ASU, 11 interdepartmental ASU, 33 regional and 9 municipal ASU are expected to operate.

The ASNTI is an integrated information retrieval system of document-factographic type, providing increased efficiency of research and development within the organizations of the Moscow municipal executive committee, as well as faster introduction of new techniques and progressive technology in the Moscow municipal economy.

The ASNTI provides automated formation of files of departmental and interdepartmental scientific-technical information on the problems of research and automation in the municipal economy, as well as data retrieval for the subscribers.

The ASNTI is based on a distributed data bank (RABD) of scientific-technical information, consisting of several data bases prepared by the All-Union scientific-technical information agencies.

The Scientific Production Association of the ASU Moskva is putting on display an automated planning executive's work station (ARM planovika), based on the PEKVM Iskra 226. It is intended for automation of planning calculations at all levels of planning. It may be employed either as a standalone computer or as an intelligent terminal of a central computer complex (TsVK).

In its capacity as a standalone computer, the ARM planovika enables: management of a local information fund (LIF); entry of data from a console, loading of information files formulated in a central information fund into the local information fund, calling up and correction of data in the LIF, utilization of data from the LIF in application programs, creation of an information retrieval system on the basis of the LIF, carrying out of computations, running of programs, including such which employ data obtained by communication links, and execution of separate portions of the programs of an assignment being carried out in a YeS computer.

The primary users of the ASNI KP (automated system of collective-use scientific research) in the municipal administration of Moscow are collective subscribers (organizations) of the Moscow municipal executive committee, carrying on investigations and projects with use of the hardware, software and information resources of the system.

The first echelon of the ASNI KP presupposes the creation of problem-oriented subsystems on construction, automation, the municipal administration, transportation, power and fuel, and public health, including 16 complexes of simulation problems, among them a model for analysis of the technological processes of the forging and shaping industries with test stand techniques; a simulation system for investigation of computer networks; a model of the disposition of the populace and labor resources; a model for analysis of passenger traffic in the municipal transit network, and so forth.

The first echelon of the ASNI KP also entails the creation of seven service systems, including the planning and implementation of research, the input, processing and output of graphic information, interactive procedures and remote access, and an information service.

The ASNI KP consists of procedures, information, software and hardware.

The hardware complex of the ASNI KP is based on the hardware of the Scientific Production Association of ASU Moskva, as well as local (branch) computer centers of the organizations of the Moscow municipal executive committee. The hardware is arranged in a three-level structure.

The foundation of the ASNI KP within the municipal administration will reduce the time and the labor intensity of research, improve its quality, eliminate duplication of projects and better the working conditions of the municipal administrators.

The automated system for management of classification systems of technical and economic information of the ASU Moskva complex (ASVK TEI ASU Moskva) is an automated system for management of All-Union and municipal classification systems of the complex. It has been developed as a general-access information component within the systems servicing the ASU Moskva complex for control of the sectors of the Moscow municipal economy.

The ASVK TEI provides automated formation and management of a file of All-Union and municipal classification systems for the Moscow municipal executive committee, as well as provision of updated information on the classification systems functioning within the context of the ASU Moskva in a mode of periodic selective notification in accordance with the interests of the subscribers and upon request of the latter. The ASVK TEI is built along the lines of a data bank, and the hardware complex is based on use of computers of type YeS-1033 or higher, with a working storage volume no less than 320 Kbyte.

Adoption of the ASVK TEI of the ASU Moskva complex will allow creation of a system of management of the technical-economic information classification system, founded on a single technique of organization and functioning of the components, taking into account the basic guidelines of the state system for management of All-Union classification systems.

This will provide the developers of automated systems, as well as the enterprises and organizations of the Moscow municipal executive committee, with reliable and timely information concerning the All-Union and the municipal classification systems in the form of computer printouts on machine storage media or on the screen of a video terminal.

Adoption of the system will lower the cost of creation and operation of control systems of the ASU Moskva complex through the use of information on classification systems from the ASVK TEI.

The exhibit presented the experience of Leningrad in implementing the program Intensification-90.

The automated information processing system ASOI-rayon is intended to automate the comprehensive planning and control of the economic and social development of the administrative rayons of Leningrad. The system provides a far-reaching improvement in the comprehensive planning and control of the development of a rayon by bringing to these processes the modern methods and means of information gathering, compilation, storage, processing, transmission and depiction.

The ASOI-rayon provides the opportunity of making calculations on the basis of the primary indexes of the plans of comprehensive economic and social development of Leningrad, as well as the general municipal development plan; it assures a proper balance between the development of the enterprises and organizations of the ministries (offices) and the municipal administration; and a regulated development of the administrative rayon, creating the most propitious conditions of work, domestic life, and relaxation for the populace.

The next phase of development of ASOI-rayon will confront the task of making analytical and optimization calculations and assessment of plan quality on the basis of logical-linguistic models of computer representation of knowledge and by the method of artificial intelligence. This work is being conducted by the production association Lensistemotekhnika. The introduction of ASOI-rayon will upgrade the quality and reduce the term of development of the rayon plans by a factor of 2-2.5, increase their validity, exercise supervision of the implementation of the rayon plan, and improve the style and culture of work. The annual economic impact from adoption of ASOI-rayon in Leningrad will be more than 2 million rubles.

The production association Lensistemotekhnika has developed a program technological complex for management of local-area data bases (PKT Velobad), designed to create and manage information systems in the PEKVM Iskra-226, either in off-line condition or in a link with other information systems. The PTK Velobad enables the following functions: design of local data bases (LBD); design of the information input/output formats; loading and actualiza-

tion of the LBD from keyboard (with or without an input format) or via magnetic storage medium (magnetic disk or tape); retrieval of information from the data base and presentation of the data on demand (with or without an output format) on a screen or alphanumeric printer; output of information from the LBD on demand and recording in the necessary composition on magnetic storage medium (disk or tape); connection of user programs for performance of computations or other functions not provided by the standard facilities; service procedures on data sets (duplication, marking of disks, etc.); creation and editing of design documentation for an information system (IS) under development; editing of output computer sheets obtained from YeS computers in the form of printed pages recorded on magnetic tape during the phase of operation of the information system.

Using the PTK Velobad in the creation of an IS can substantially reduce the development time as compared to the traditional technology of creating an IS by the method of developing unique software for each task with minimal continuity among tasks; and a faster development process, due to the fact that the PTK Velobad provides such technological processes (compilation of information, actualization of information, output) as are necessary to each IS.

It only remains for the user to implement the specific information processing for the given IS.

Presently, PTK Velobad is being used to develop and organize local end-user data bases in the distributed data base of the automated planning calculation system Lengorplan. The resources of PTK Velobad are being used to design OASU IASUP [automated industrial-sector control systems, integrated automated process control systems] in a number of cities and oblasts of the country.

The exhibit also presented various peripherals.

The type SMP 6408 graphics output unit (a plotting board type device) is intended for output on paper of information presented in the form of a graphical image in a rectangular coordinate system: blueprints, diagrams, graphs, characters.

The unit can be used in the computer complexes SM EVM and ASVT-PS, and at the automated work stations (ARM) of computer-aided design systems (SAPR).

The unit operates from a microprogrammable controller. The microprograms for the controller are entered into the permanent memory. Graphic information is put into the unit from a VK (computer complex) or an external magnetic tape storage and is entered into a working storage. The link to the VK occurs across impedance matching elements.

The device receives graphical information from the VK in bytes and sends it to the VK in 8-bit condition codes. The input language (system of instruc-

tions) is symbolic, encoded in accordance with the KOI-7, and contains instructions to control the styluses and to sketch in vectors at any given angle, arcs, circles, symbols, Russian and Latin alphabet, numbers and special characters.

The control unit processes the graphical data and sends control signals to two stepping motors, which move the carriage with writing elements by a cable system.

The information is recorded by ball writing elements on paper, secured to the plotting board by a vacuum suction.

With the buttons of the control console, the operator may change the speed of the sketching, the acceleration, the scale, the stylus lowering time delay, or specify the source of information and other conditions.

The basic parts of the unit are: a pedestal, a two-coordinate mechanism, and a rack. The pedestal contains the microprogrammable controller, the working storage module, the permanent memory, the BIF-106 interface unit, the control units, the power unit, the ventilator units, cords and jumpers.

The two-coordinate mechanism includes: the operator and control consoles of the PU-27, a pump, a carriage with electromagnet assembly, and two reducers with motors.

The rack holds the external memory, which comes in two modifications. The average working life of the unit is 10 years, and the reconditioning time is 1 h.

Specifications of the SPM 6408

Type of plotter	Plotting board
Information storage medium	Drafting, cartographic paper
Principle of recording	Mechanical
Writing element	Ball type
Work field format	A1 (594 x 841 mm)
Number of recording colors (styluses)	3
Minimum programmable interval, mm	0.1
Resolving capacity, mm	0.05
Frequency of recording, mm	0.15

Maximum recording speed along the axis, mm/s	600
Static and dynamic error, mm, not greater than	±0.2
Coordinate system	Absolute and relative
Type of interpolation	Linear and circular
Set of alphanumeric characters	2
Power consumption, kV·A	Up to 1.2
Outside dimensions, mm:	
Recording device	1000 x 1300 x 1700
External magnetic tape memory	680 x 680 x 1280
Mass, kg	Up to 360

The local-area computer network of SM computers is represented by two basic process control computer complexes (UVK), differing according to the type of built-in processor and linked together by an IRPS (20 MA current loop) interface.

The basic UVK include: the SM 1300 or SM 1300.01 processor; a magnetic disk control of the computing process (UVP MD) between 4.8 and 19.2 Mbyte in capacity; an alphanumeric video terminal; a printer; the IRPS two-channel controller; and a controller of the hardware interface.

The basic UVK built from the SM 130 has a working storage of 28 Kwords and a hardware loader, enabling the initial loading of the operational systems to take place from various peripherals, including a computer network. It is intended for use as a terminal computer in a network.

The UVK built from the SM 1300.01 has a working storage of 124 words (with memory supervisor) and an expanded set of instructions. The complex is intended for use as a terminal computer or a message switching center.

The software for each of the computers included in the homogeneous local-area network of SM computers provides the option of using the OS-RV operational system with network program package.

The network packages provide: setting up communication sessions; transmission of files; transmission and starting of collateral instruction files; monitoring of information transmission with printout of notification as to transmission errors.

In the delivery of systems with expanded configurations, the operational systems and remote processing program packages on demand of the user are provided in the distributive and/or generated form.

Each of the UVK in accordance with the needs of the user may be supplemented by magnetic tape, magnetic disk, floppy disk external memories, interfaces to an object, to analog or to digital signals, as well as an assortment of SM computer equipment (bus selector, programmable clock, etc.). The total assortment of such equipment is around 30 items.

Matters relating to the configuration of optional equipment, electrical compatibility, system testing, and so forth are resolved by the supplier to suit the demands of the client.

The Elektronika NMS 01100.1-02 interactive computer complex (DVK) is a fundamentally new class of universal personal microcomputer, offering the prospect of direct supervision of all stages of the process of information processing and storage. The DVK may be used for mathematical and scientific-technical calculations in information reference systems; or in the capacity of a development engineer or designer's work station in computer-aided design systems.

The DVK includes: the Elektronika NMS 1201.01 microcomputer; the 15IE-00013 display; the Elektronika NGMD-6022 floppy disk storage; the 15VVP-002 heat-activated printer or the UVVPCh-30-004 matrix printer.

The PP EVM YeS 1840 personal professional computer is intended for automation of individual work: scientific, engineering, economic and other calculations and investigations; computer-aided design; organization of control; measurement, registration and information retrieval systems, teaching systems.

The PP EVM YeS 1840 is the first personal professional computer of the Unified System in the USSR.

The PP EVM YeS 1840 is a desktop computer, able to operate in off-line condition or in local-area and global networks.

The computer with its software meets the demands of a broad range of users, being able to function in the Russian language and at the same time allowing the use of the system and application programs of comparable Western computers (it is IBM-compatible), which offers the possibility of creating a well-developed application software.

The PP EVM YeS 1840 employs the technique of software-controlled changing of the character generators of the display and printer, which is the foundation for the use of different alphabets and creation of national versions of application software for use of the computer by the member nations of the SEV and the republics of the USSR. Various peripherals can be hooked up (the basic assortment includes a display, a keyboard, a printer, and so forth).

The modular design and the unified interface with various options of change or expansion as the workload increases enable:

- use of additional profession-oriented modules and additional peripherals (plotters, digitizers, analog-to-digital converters, and so forth);

- replacement of one type of peripheral by another.

The PP EVM YeS 1840 is easy to operate and convenient to use.

The system software of the computer includes an operational system, utility programs enabling the use of storage media, on-line correction and adjustment to the parameters of a specific setting, the program TELETEKST for transmission of files between the YeS 1840 and YeS computer models connected at the S2 interface, as well as the BASIC M86 programming system and the ABAK basic application program package.

The system and application programs of the popular IBM PC may be used in the YeS 1840. It is also possible to use the operational system MIKROS86, which has an emulator of the system and application programs of the OS1800 of the 8-bit SM 1800 microcomputer.

The set of test programs checks the serviceability of the functional units of the PP EVM YeS 1840 and the copying of test diskettes.

The AGAT personal computer is oriented toward users with no special training, and is intended for widespread use in the system of education, the sector of service industries and public health.

The distinguishing feature is the modular technique of implementation of the design, functional and architectural options. The AGAT personal computer offers the user ample opportunities of presentation of alphanumeric and graphical information on the monitor screen with colored image. A floppy disk storage is used as the external memory.

The user need only know how to employ the keyboard and carry out the instructions appearing on the screen, which offer a choice among several alternatives.

Specifications of the AGAT Computer

Outside dimensions (without peripherals), mm	500 x 371 (5 x 188)
Mass, kg	12
Word length, bit	8
Performance, operations/h	$3.5 \cdot 10^5$

Volume, Kbyte:	
Working storage	64-256
Permanent memory	32
External memory	2 NGMD YeS-5088.02 (250 Kbyte)
Information presentation format:	
Alphanumeric	32 x 32 characters (8 colors) 64 x 32 characters (Russian and Latin alphabets, lower and upper case)
Graphical	256 x 256 dots, 128 x 128 dots (8 colors), 64 x 64 dots (16 colors)
Keyboard	Off-line unit, connected by sequential channel to the basic unit, 74 keys, including 15 function keys
Interface:	
Internal	AGAT bus (60 lines, 7 connectors)
External	1 sequential channel, 2 parallel channels
Printer	YeS-7189 mosaic printer
Power consumption (without external equipment)	60 W from a 220 V network
System software	BASIC disk operational system, system monitor, PEVM AGAT tests, interpreter of the educational professional langauge Rapir
General purpose software	Text editor, graphics editor, numerical simulation system (electronic table)

12717
CSO: 1823/321

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

UDC 621:65.011.56

NC MACHINE TOOLS, MODULAR SYSTEMS IN COMPONENT PRODUCTION URGED

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 4, Apr 86 pp 21-24

[Article by Doctor of Technical Sciences B. M. Bazrov: "The Automation of Parts Production Using Modular Technology"]

[Text] Large capital investments as well as the resolution of fundamentally new tasks are required to increase the output of automation equipment, machine tools with NC [numerical control] and systems of automated equipment and robotized complexes. The automation of parts production, however, especially in small-series production, does not generate the anticipated economic saving. Thus, a search for ways of raising the efficiency of automation is topical.

Resolving the task of raising the efficiency of the automation of the series production of a broad range of products should proceed along the path of making use of the merits of mass and small-series production. Mass production today is distinguished by high productivity and low flexibility. High productivity is ensured first and foremost through the combination of technological conversions in time and a broad differentiation of the technological process, reducing time expenditures for resetting. The low flexibility is explained by the employment of special equipment and tooling that is intended for the machining of specific articles.

Modern small-series production is distinguished by high flexibility and low productivity. The high productivity consists of the opportunity of easy conversion from the machining of one article to the machining of another thanks to the use of universal equipment and tooling. The low productivity is the result of the sequential machining of individual article surfaces that are not combined over time.

Thus, for the series production of a broad range of products, it is necessary to take the high productivity from mass production and the flexibility from small-series production.

The resolution of tasks of raising the efficiency of manufacturing automation should begin with improving the technology of its manufacture.

The modern technology of parts manufacture is built on the principle of the machining of the individual surfaces of the part. This relates both to the development of unitary and standard and group technological processes.

Such a structure for the technological process has the shortcoming that the surfaces of the part that are intended for the joint fulfillment of this or that function are often machined in different operations or from different orientations. As a result, distortions in the relative positioning of these surfaces accumulate and the necessity of reducing them through additional operations arises when one of these surfaces is used as a base.

A consequence of the shortcomings in the technology employed is the multivaried nature of the planned technological process, which leads to an unjustified diversity in the machining processes of parts of the same type and in that way hinders the incorporation of standard and group technology. The diversity of the technologies of small-series and mass production is that in small-series production the surfaces are machined sequentially, but with a minimum number of operations, while in mass production, they are done in parallel to a considerable extent with a high level of differentiation of the technological process in the operation. The latter makes it possible to realize a continuous form for the organization of production which provides for the highest technical and economic indicators.

The task of developing technology that would combine the positive aspects of the technologies of small-series and mass production and would make it possible to obtain high productivity and high flexibility had been posed. With this aim, a modular technology based on the idea that any part can be composed of a limited range of surface modules has been proposed. Surface modules (MP) are understood to be the combination of parts surfaces that are intended for the fulfillment of any automatic part service function. It is well known that all parts surfaces can be divided into two types: execution (locating and working) and bonding.

An analysis of locating and working surfaces shows that they fulfill their functions, as a rule, as a set (combination) of surfaces. It is well known, for example, that for locating the part on the machine, when the part should be deprived of the six degrees of freedom, a set of bases of three surfaces is necessary that form a triangular coordinate system. Analogously, a part performing the function of cutting the material, for example, should have a set of surfaces that forms the cutting part and the dimensional connections among them.

Research on such modules for parts surfaces shows that there are 22 of them in all (Fig. 1).

With the availability of standard technological processes for the manufacture of the surface module of each type, the technology of parts manufacture is set up in the following manner. First, the part is broken up into surface modules with an indication of the design base of each module. Next the sequence of machining for the module surfaces and the technological bases are determined. The operations combining the machining of several MPs are then formulated,

wherein both a single module and several MPs of one or several types can be machined in a single operation. In the end, a routing for parts manufacture is formulated, after which the standard technology for the manufacture of the corresponding surface modules is called up from card files or computer memory.

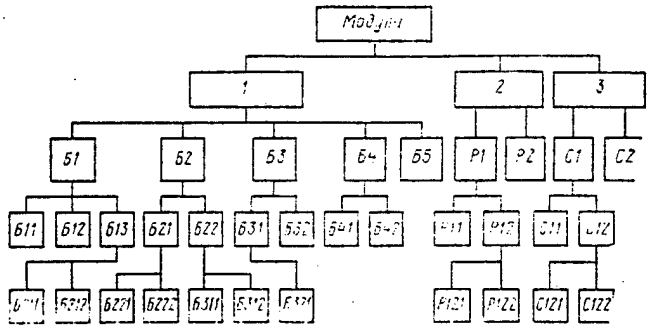

Fig. 1. Classification of Parts Surface Modules

1--Locating; 2--working; 3--bonding; b1--aggregate of planar surfaces; b2--aggregate of threaded and planar surfaces; b3--aggregate of planar and cylindrical surfaces; b4--aggregate of conical and planar surfaces; b5, P2, C2--complex surfaces; P1, C1--simple surfaces; b11--external surfaces; b12--internal surfaces; b13--combined surfaces; b21--combination of cylindrical threaded and planar surfaces; b22--combination of conical threaded and planar surfaces; b31--two planes and cylindrical surface; b32--two cylindrical surfaces and a plane; b41--conical aperture and plane; b42--external conical surface and plane; P11, C11--planar surfaces; P12, C12--surface of revolution; b211, b221--internal threaded surface and plane; b212, b222--external threaded surface and plane; b311--two planes and aperture; b312--two planes and external cylindrical surface; b321--two apertures and plane; P121, C121--internal surfaces of revolution; P122, C122--external surfaces of revolution.

Key: 1--Modules.

The application of modular technology opens up broad possibilities for raising the efficiency of the mechanical machining of blanks, especially in flexible automated production (GAP).

In the sphere of raising the efficiency of GAP operation, the application of modular technology resolves the tasks of raising the precision and productivity of machining and utilizing a flow form of production organization in unit and small-series production.

It is well known that precision in the relative positioning of surfaces is required for the joint execution of a combination of surfaces of this or that parts servicing function. Modular technology provides for the requisite

precision in the relative positioning of the surfaces through their machining from one orientation on one machine tool.

Raising the productivity of machining is accomplished through the execution of multi-spindle and multi-tooled machine tools that combine technological conversions in time. Such machine tools combine the features of specialized and universal machine tools. The machine tools are specialized in that they are intended for the machining of a limited range of surface modules and should work as an operational machine tool. At the same time, they are universal, in that one and the same surface modules belonging to different parts are machined on them.

The fact that the machine tool becomes specialized opens up broad possibilities for the use of highly productive machining methods that up until now were profitable only in large-series and mass production. For example, the employment of a broaching method that is distinguished by high productivity becomes profitable. For the machining of surface modules that are a combination of planar surfaces and holes (smooth or with a keyseat or splines), it is expedient to create a machine-tool module with a broach magazine.

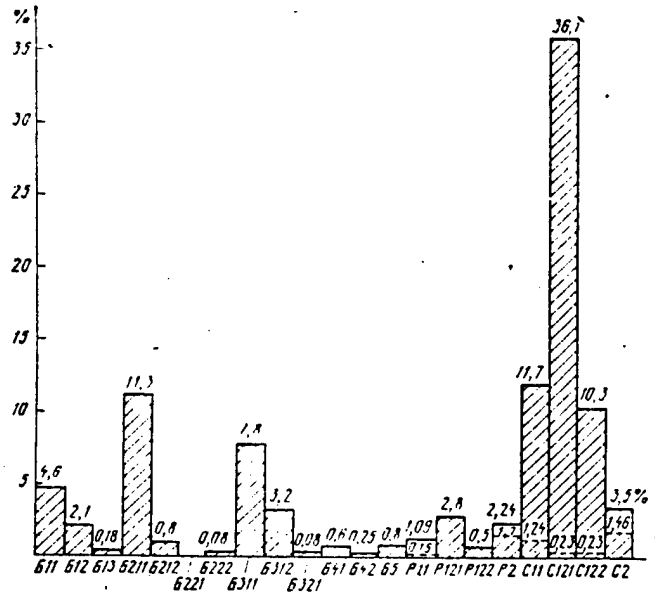

Fig. 2. Histogram of the Distribution of Parts Surface Modules of Centrifugal Pumps

With regard to the new functions, the machine-tool module should have a structural relationship that is to a considerable extent similar to that of a standard-unit-type machine tool intended for the simultaneous machining of several surfaces and have, like a machining center, a tooling magazine. The use of modular technology alters the organization and control of parts

manufacture in unit and small-series production. The employment of a flow organization of production that provides for good technical and economic indicators becomes possible. For this purpose, the whole range of parts subject to manufacture in the assigned calendar time interval undergoes an analysis of the makeup and quantity of its surface modules. By way of example, Fig. 2 presents a histogram of the distribution of parts surface modules for three standard sizes of centrifugal pumps. The number of parts included: pump housings, impellers, roll cages, rings, shafts, covers, bushings, flanges, T-joints, plugs, sleeves, union and shoulder nipples etc. After the indicated analysis is carried out for the whole aggregate of parts subject to manufacture, they are divided into conditional groups depending on the surface modules contained in the part (Fig. 3). The groups are called conditional because one and the same part, as a rule, goes into several groups, since it contains several MPs of various types. Depending on the routing of the manufacture of this part, it is present in these groups in the appropriate sequence. After the formation of these groups, the parts of one group are sent for machining to the appropriate machine-tool module, creating a flow in this manner. Knowing the shift assignment, the tooling set-up and attachments are prepared in advance.

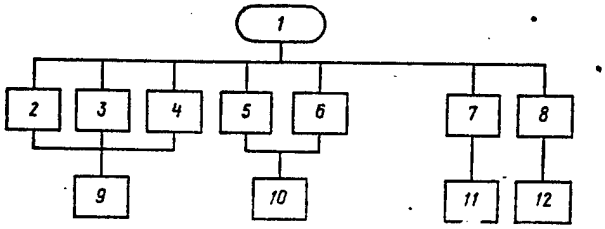

Fig. 3. Organizational Diagram of Parts Manufacture in Modular Technology

1--Aggregate of parts subject to manufacture over the calendar time interval; component parts: b11 (2); b12 (3); b13 (4); b211 (5); b212 (6); C122 (7); C2 (8); 9--MS-1; 10--MS-2; 11--MSP-1; 12--MSP.

Modular technology imparts a new quality to the technological process--a flexibility that makes it possible to alter, within certain limits, the machining sequence of surface modules with no detriment to the quality of parts manufacture. The flexibility raises the utilization factor of the equipment. If certain machine-tool modules have large lines of parts and others are unutilized, for example, it is possible to alter the routings of parts machining.

The range of the machine-tool modules has a large effect on the technical and economic indicators of GAP. In unit and small-series average-sized parts production, the creation of a machine-tool module for the machining of one type of MP is not expedient, since the range of machine tools is expanded, which entails an increase in transport operations, production space and the quantity of attachments and re-installation of blanks as well as the number of employees. It is therefore more efficient to create machine-tool modules for

the machining of various types of surface modules. A large mix of MPs machined on one machine-tool module, however, will bring that machine tool nearer to existing universal-type machining centers with all of the shortcomings noted above. The merits of the operational machine tool will therein be lost. The optimal mix of machine tools, therefore, should be determined in each specific case.

The grouping of MPs of various types for one machine-tool module should be executed according to commonality of technology, method of machining and the kinetics of constituent movements. As a result, seven or eight machine-tool modules of various types are required for the manufacture of all types of surface modules in unit and small-series production.

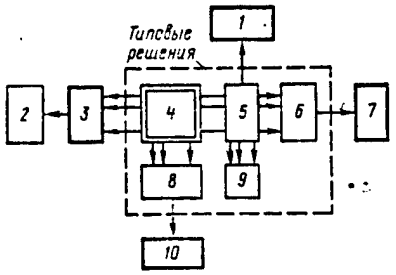

Fig. 4. Planning Diagram of Parts, the Technological Process and Machine-Tool and Measuring Systems Based on Standard Solutions

1--Technological process; 2--article; 3--part; 4--surface modules; 5--technological processes of MP manufacture; 6--machine-tool modules; 7--machine-tool system; 8--measuring modules; 9--tool set-up modules; 10--measuring system.

Key: 1--Standard solution.

In the area of raising the efficiency of GAP creation, the application of modular technology permits a reduction in time expenditures and expenses on the planning and manufacture of equipment, tooling and technological processes through the broad utilization of standard machine-tool equipment, standard MP manufacturing technological processes and standard tool set-ups and measuring equipment. Control programs are drastically simplified, since the mix and sequence of technological conversions carried out on a given machine-tool module will change little. The system of automated planning for technological processes will be substantially simplified. Fig. 4 presents a planning diagram of the parts, technological process and machine-tool and measuring systems using standard solutions. A designer planning a part should make use of the MP mix and cite their specifications on the part blueprint with an indication of the design bases and requirements for the precision of the relative positioning. In the technological preparation of parts production, all of their MPs are subjected to an analysis of producibility. Later, using

standard solutions, the technological processes and machine-tool and measuring systems are planned.

Thus, the incorporation of modular technology will permit a substantial increase in the efficiency of the mechanical machining of parts and its automation.

12821
CSO: 1823/316

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

BEARING PLANT INTRODUCES ROTARY PRODUCTION LINES

Moscow IZVESTIYA in Russian No 293, 20 Oct 86 p 2

[Article by M. Ovcharov, correspondent (Saratov)]

[Summary] The article is an interview with Ivan Andreyevich Yaskin, director of State Bearing Plant No 3 (GPZ-3), regarding modular rotary production lines which the plant is introducing. Twenty of these lines are now in operation at GPZ-3. Several dozen robots are installed on each line. Whereas a robot that performs a single operation can machine only 10-15 parts a minute, a rotary module can produce from 60 to 120 finished parts in the same period of time, according to Yashkin. Production of needle bearings has been completely automated at the plant with the aid of this equipment, and the lines can be used to manufacture a number of products other than bearings.

Yashkin said that the plant itself built the equipment for the rotary lines. A special design bureau and a machine-tool building shop were created for this purpose. The plant was assisted by academician L. Koshkin, who developed the rotary technology. Yashkin said that GPZ-3 is receiving requests from other plants to buy rotary equipment, but it still does not have enough rotary lines to meet its own needs. He said a large-scale program called "Rotor" has been outlined which calls for designing and mass-producing such lines.

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CSO: 1823/46

INTENSIFICATION PROGRAM RESULTS, PROBLEMS DISCUSSED

Moscow STROITELNAYA GAZETA in Russian 22 Aug 86 p 1

[Text] The starting program for construction jobs particularly important to the Ministry of Machine Building has been 113-percent fulfilled over the last 7 months. However, things are not going that well at all of the construction sites of this leading machine-building ministry.

Glavsevkavstroy [Chief Construction Bureau For the Northern Caucauses] has especially "distinguished" itself. Since the start of the year, it has done practically nothing at all at the construction site for the Salsk Forge and Press Factory in Rostov Oblast. New work was supposed to be started here during the fourth quarter of the year. You will not find more than one-tenth of the builders at the site. Therefore, out of 1,290,000 rubles earmarked for construction, only 373,000 have actually been spent. Glavsevkavstroy has also made a mess out of still another important project, the construction of an engineering laboratory for the Taganrog Kuzrobot Design and Technological Institute. Only 112,000 rubles worth of a planned 730,000 has been completed and to put it simply, the whole project has been dropped.

The Ministry of Heavy Machine-Building of the Ukrainian SSR has two important machine-building factories under construction and both of them are in Dnepropetrovsk. At the machine-building factory, the general contractor assumed responsibility for finishing construction of the engineering laboratory building in the third quarter but the builders have so far not lifted a finger to keep their word. In 7 months time, only one-third of the year's planned construction has been completed. The timely intervention of specialists is also required at the Dnepropetrovsk Heavy Press Factory where ground water has caused the foundations to settle.

Last year, the Ministry of Industrial Construction of the Belorussian SSR was supposed to turn over for operation a block of auxiliary shops at the Orshansk Active Control Devices Factory but there is little hope that this will actually be done even by the third quarter of this year.

In the amount of time remaining for contractors who have fallen behind in their construction work for the Ministry of Machine Building, it is necessary for them to completely reorganize their work so that these new facilities can be open for use as scheduled.

[Article by I. Mushastikov, Moscow Oblast]

Yegoryevsk

The construction of a new small-series shop at the Yegoryevsk Komsomolets Machine Factory was started in January of this year and as soon as December, it will already be ready for operation.

"How long is this going to continue?" wondered the foreman of the cement form carpenters, A. Trifonov. "This is an especially important construction site for the state but there is no way of getting a regular scheduled supply of cement. We fight and fight and keep on demanding but it's like water off a duck's back! Worst of all, here is a crew of 20 strapping fellows who can and want to work and they are standing around with nothing to do. We keep hearing all this talk about 'work ethic' and 'the need to reorganize'. How can we reorganize when they keep stopping us from doing anything?".

The foreman's quandaries were interrupted by the heavy rumbling of a cement truck.

"Finally!" said Aleksey Mikhaylovich and looked at his watch, "Just as always. The first truck comes at 11:00 instead of 8:00 which is when it's supposed to be here. Thank you at least for not having waited until 1:00 as you have before. Well, I think that today we will have to stay late again to finish the job. We have our duties to fulfill...".

"Once the small-series shop is opened, the plant's production potential will be considerably increased," said the plant's chief engineer, A. Anikin. "The new shop will help us to substantially increase our output of NC machines and automated lines".

Because they understand the special importance of this job, the builders of Construction and Assembly Bureau 2 [SMU-2] of Mosoblstroy-22 [Moscow Oblast Construction Trust 22], the general contractor, and the subcontractors have all assumed greater social responsibilities to finish construction of the shop a month ahead of schedule. "We gave our word and will keep it": over 7 months of work, the general contractor has spent 556,000 rubles on the job and that is 108 percent of the plan.

Yes, much has already been done. The assembly work is completely finished for the very large bay that will house the automated lines and the work on a floor stand for assembly operations is being finished. In the other bays to be used by the final finishing and tool-working sections and the metrological laboratory, the work is proceeding rapidly. Brick partitions are being built there, machine beds are being laid and the roof is being constructed. Alongside the workers from SMU-2 are toiling assembly personnel from the MSMU [not further identified] of the Stalkonstruktsiya Trust, roofers from SUOR-4 [Specialized Bureau for Finishing Work 4] and builders from other subcontractors.

There still awaits the most serious stage of work, the assembly of the basic process equipment, lifting machinery, power systems, ventilation and finally the start-up of the shops. The scheduled opening of the shops is promised by the good pace of work in all areas and the high quality of construction against which neither the designers nor the clients have any objections.

Since 1 June of this year, SMU-2 has been operating on the principle of collective contract and the results are already visible. In July, it exceeded the quota of construction and assembly work done using its own resources by the amount of 25,000 rubles.

The contractor, suppliers and client are all working together in a harmonious and orderly fashion. The technological equipment is also being assembled on time. Everything would be going quite well were it not for interruptions in financing. The work has been financed only as far as 13 August and the plant does not have a single kopeck in its account! It now owes 500,000 rubles to the construction suppliers and another half million to the builders. This gives one the impression that the general director of the association, V. Shashkin, is following the odd principle that debts are not weighing down his pockets too much.

The builders are confident of their powers and are fulfilling their responsibility to open this plant on time.

[Article by V. Chernobay, Rostov oblast]

Taganrog

For 7 years now, the Taganrog Construction Bureau of the Glavsevkavstroy Trust Number 1 has been working on the 7-story engineering and laboratory wing of the Kuzrobot Design, Construction and Technological Institute.

So far, the general contractor has only carried out one million rubles worth of work. For this building to be opened on time, it will be necessary to do more than half as much again that amount of work by the end of the year. That is scarcely realistic because over a period of 7 months this year, they have only carried out 112,000 rubles worth of construction and assembly work.

"The Kavelektromontazh [Caucasian Electrical Assembly Bureau] and Kavsantekhmontazh [Caucasian Safety Equipment Assembly Bureau] trusts," says the director of the Kuzrobot's Major Construction Bureau, I. Kravets, "have only met their work quotas by some 10 percent. They have still not installed the heating and ventilation systems nor any of the electrical equipment. Naturally, this has set back the finishing of the facilities".

At the same time, nothing is stopping the Otdelstroy [Finish Construction Trust] Trust from starting roofing work but nothing is being done. They cannot complain about their suppliers or the subdivision directors at Soyuzliftmontazh [Soyuz Elevator Assembly Trust] and Spetsstroy [Special Construction Trust]. However, the elevators ave still not been built and even the shower has not been installed. The general contractor, Taganrog Construction Bureau (S. Grudz, director) is taking workers away for other jobs

such as the construction of a combine factory and waste treatment plant. "These jobs are more important,' says the deputy chief engineer of Trust Number 1, V. Chistoforov.

Meanwhile, the builders of modern forging robots have already waited 8 years for new housing while being crowded into their old quarters, an old broken down factory building.

[Article by M. Beketov, Mordvin ASSR]

Ruzayevka

"The builders cannot do their work normally" -- this is the opinion one hears today at the construction site for a factory to produce automated sheet-metal stamping lines in Ruzayevka.

The marathon race begun in 1976 (with the general contractor being Mordovstroy [Mordvin Construction Trust] of the USSR Construction Ministry, director G. Yudin) is reaching its finish. The starting complex now includes the plant's second stage.

However, according to the schedule of the USSR Ministry of Assembly and Special Construction Work's [Minmontazhspetsstroy] Volgoneftekhimmontazh [Volga Petroleum and Chemical] Trust, the entire assembly of technological equipment still needs to be carried out. It still must perform over 122,000 rubles worth of construction and assembly work on 6 different objects. This may seem like nothing to worry about but unreadiness and a shortage of pipes and much of the equipment have caused alarm over whether the staring complex will be finished on time. "The builders are behind schedule but they have given us a solid front of work," says the assembly foreman, V. Kursa. "They are being held up by something else -- a shortage of pipes for more than 7 kilometers of pipelines. We expected to receive them from the general contractor during the first quarter but we have only heard promises so far...".

Other crews are now also having to stop work while they wait for pipes and equipment.

"Sometimes we get the impression that the general contractor and the factory director (L. Kuryanov) have made an unspoken agreement to see who can do the most to stop us from finishing the job," said the chief engineer of the assembly bureau for Volgoneftekhimmontazh, V. Lushenkov.

Of course, he did not mean that seriously but there is some truth in what he said. For one of many examples, the builders handed over for assembly certain equipment such as a neutralization station, and the client did not provide rubber pipes. Both the general contractor and the client pushed for the construction of the water treatment towers and their construction was supposed to be started in May but so far, neither the equipment nor any of the other necessary materials have been provided.

[Article by A. Roginsky]

City of Nikolayev

The lubricating systems produced by this factory are very important because they considerably extend the service life of heavy presses, machine tools and other equipment. And for that reason, the factory in Nikolayev leads the Ministry of Machine-Building Industry's [Minstankoprom] list of important plants despite the fact that it will have to have 1,300,000 rubles worth of construction work done this year.

Everyday, the demand for products from the Nikolayev Experimental Factory for Lubricating Systems is growing. These systems considerably extend the service life of heavy presses, machine tools and other equipment.

To put it simply, the factory has a great need to increase its production potential. Why has its production been confined to such a small scale? The director of the plant's capital construction bureau, V. Krivak answered: "Financing with the client would not hold things up any but the Nikolayevpromstroy complex has little power".

More than two million rubles have already been spent in three years. This type of yearly planning "by the teaspoon" has also affected the organization of the supply of materials and equipment and consequently the course of work and worker morale. Foreman N. Malyuty of the Krivorozhstalkonstruktsiya [Krivoy Rog Steel Construction] Trust, for example, initially undertook the construction of the compressor station with great energy. Later, the ardor of the workers was somewhat dampened because the job was constantly set back by incomplete shipments of equipment.

To avoid being idle, the workers have been assembling as it comes in everything sent by Nikolayevpromstroy and this has violated the principles of the technology. Wing 5 is already covered but the monorails have not yet been laid and there are not even any corner units. As soon as they appear on the site, they have to be installed using the inefficient "creeping assembly" method with manual tools. This is how "low grade" work comes into being and schedules are set back.

The construction and assembly plan is nevertheless being fulfilled.

Yu. Abramov, the director of SMU-11 of the general contracting trust Sudopromstroy [Industrial Vessel Construction], gives away the firm's "secret" saying: "The work is being done chiefly by "gross output" [za schet "vala"]. Soon, we will have to get into the finer and more precise work and our indicators will drop at once".

The builders of the ventilation system and safety equipment should have long ago shown up at the site along with machine assemblers and electricians but...

"The general contractor and client have us cornered," says the chief engineer for Construction Bureau 18 of the Chernomorpromsantekhmontazh [Black Sea

Industrial Safety Equipment Assembly] Trust, V. Kim. "The end of the year is approaching, there is going to be a real pinch for workers and the client has up to now not given any nonstandardized equipment for this job".

Recently, Minstankoprom received a letter in which the assembly crews repeatedly asked for faster shipments of hydraulic valves and condensors despite the fact that it is the client that should have handled this in the first place.

The construction job has been carried out under such conditions for a long time now. The builders are not exactly jumping to finish up even now that the plant is supposed to be opened in the fourth quarter. And all of this was caused by the illiterate planning when work was started. Wing 5 was therefore broken down into two initial stages of two bays each. The first stage is the machine and repair shops while the second includes the casting and heat treatment divisions. This has produced a technological curiosity because the entire wing shares the same single ventilation, heating and water supply systems. And the assembly workers have had to stop work and even go back and do some work all over again.

12261
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AUTOMATION ACCOMPLISHMENTS: PROBLEMS IN UKRAINE'S MACHINE SHOPS

Kiev PRAVDA UKRAINY in Russian 3 Sep 86 p 2

[Article by I. Pichakhchi, editor, factory newspaper "Za Progressivnuyu Tekhnologiyu"; Yu. Shevchenko, reporter, oblast newspaper "Radyanska Donechchina"; N. Ladanovskiy, "Pravda Ukrainy" reporter; Ye. Kukharskiy, chairman, head group of people's control, PO [Production Association] "Elektroizmeritel"; V. Voznyy, inspector, city committee of people's control; B. Popov, "Pravda Ukrainy" reporter; V. Styepnoy, not-on-the-staff inspector, Lenin district committee of people's control; A. Gomenyuk, manager, robotics sector, Vinnitsa SKTB [special design-technological bureau] of potato processing equipment; N. Baras, "Pravda Ukrainy" reporter; Yu. Pedchenko, adjuster, Konotop plant "Krasnyy metellist"; G.Gnezdilov, "Pravda Ukrainy" reporter: "Does The Robot Need A Vacation? Republican Raid"]

[Text] Donetsk:

Machines Need Up-Time

A year ago, in the machine shop No 20 at Donetsk machine building plant imeni Leninskiy komsomol Ukrainy, a robot-equipped department for machining axles of belt conveyor upper rollers was commissioned. The annual capacity of 120,000 axles.

"This technical innovation costs 300 thousand rubles. The output should be high too", says deputy secretary of the plant party committee N.V. Kozlov. "The robotics complex, that includes a milling-centering machine, two hydrocopying lathes, three "Pirin" manipulators and a "KR-20" transporting system, has freed up three workers and increased productivity by a factor of 1.2. During the current five-year plan, we will widely use automated lines, machining centers and robots. 18 million rubles have been allocated for retooling.

The start has been made. At the plant, 30 CNC machine tools and a robot-equipped department are already in operation, and the second one is about to be commissioned. But unfortunately, the available expensive production capacity is not fully utilized yet.

We came to the robot-equipped roller axles machining department during a lunch break. The operator of the complex T.A. Yendaltseva, acting shop superintendent Yu.I. Babin and complex team leader N.I. Tishchenko were troubleshooting a hydrocopying lathe: three hours ago it broke down, and the robotics complex came to a standstill.

"We must make 300 roller axles per shift, but I have only made 70", the operator complains. "Of course, I will not meet the quota today".

"The complex requires constant atention of highly-skilled troubleshooters. But there are not enough of them at the plant", Yu.I. Babin is annoyed. "This is why shop maintenance mechanics have to spend tremendous amounts of time, troubleshooting smallest malfunctions of electronic equipment. This is also the case today".

The problem of repairing robots and CNC machine tools is a serious one indeed. In the chief power engineer department, there is a bureau for service and maintenance of CNC machine tools and the robotic complex. The bureau personnel is in charge of repairs and replacements of electronic systems parts. But personnel turnover here is high, because the wages problem has not been solved. A lower level electrical system is taken care of by operators themselves. The same goes for hydraulic and mechanical systems of "smart" units in shop No 20. And because, as usual, "seven cooks spoil the soup", so does the robotics department has a lot of down-time, due to untimely preventive maintenance and repairs. Also, it often operates not to its full capacity due to the lack of blanks. As a result, the expensive unit works only one shift a day, and with long interruptions at that. Instead of scheduled 120,000 roller axles, it produces only half of it.

Robots are also unproductively used at Starokramatorskiy and Novokramatorskiy machine building plants. It has become a habit here to excuse manipulators down-time because of a missing intricate electronic part. But what excuse have, for instance, managers of Starokramatorskiy machine building plant, where, at the mold filling department, a filling robot has been down for a year now, because there is now exhaust ventilation in the mold lubrication zone, whereas it is not difficult to install the ventilation.

Due to poor management by the administration, robotics complexes at Slavyansk "Slavtyazhmash" plant are also down. Production area, allocated for the new technology, does not meet standards, there is not enough service personnel. As a result, robots work only one shift a day, sometimes even half a shift.

Zhitomir:

"Special" Attitude

"Robots are the future of our production association "Elektroizmeritel", said deputy chief engineer for new technology A.I. Yakimchuk, meeting members of the raiding team. "This is why we have a special attitude toward them".

We visited the head enterprise. Its collective was among the first ones in Zhitomir to start production impelementation of robotics technological lines

(RTL). In less than four years, 37 such lines with 120 robots and manipulators have been installed. What is the return of mechanisms, that must replace operators, performing labor intensive and fatiguing operations?

Before we present comparative figures, we shall make a slight digression into a not so far past: on July 16, a facilities yard attendant on duty A.V. Borodin brought into the office of the chairman of the central group of people's control five packages dated June 25, 1986.

"What have you got there?", patrolmen asked.

"RTK [robotics complexes] components."

"Where have you found them?"

"At the dump site."

Of course, this is not a typical case, but, to a degree, it characterizes people's attitude to innovations. Deputy superintendent of mechanical shop No 10 M.D. Kirnos reported: "We have ten robots, and all work faultlessly."

"And what is their monthly output in rubles?"

"300".

"That little?"

A.I. Yakimchuk interjected:

"Why are you saying this nonsense, Mikhail Davydovich? Please write down: one thousand rubles."

And still, at a shop scale it is more than modest. Soon we understood the reason for such low output. Simply nobody in the shop takes this work seriously. First of all, there are not ten, as the deputy shop superintendent stated, but 16 robots here, and second of all, every third one is down. We were given an explanation: two robots are being repaired, others are being readjusted for new operations. However, there were neither repairmen nor adjusters in sight. The picture in shop No 11 is the same. All in all, in shops No 10 and 11, 31 robots have been installed, but only 12 were working.

Where are the rest of the 90 robots, and what do they do? We got an official report from engineer V.A. Belov and head of the mechanization and automation department Ya.V. Khristich: in shop No 1, 29 robots and manipulators are in the process of installation (the reason for the delay is production reconstruction), in shop No 13 all 36 robots are in the testing stage. And this is altogether incomprehensible. The head enterprise has special proving grounds. It is there, that scrupulous debugging and experimental-industrial operation of all RTK and RTL must be performed. Shops should receive them completely ready for production.

All in all, out of 120 robots and manipulators, that, according to reports of the head enterprise of the "Elektroizmeritel" association, are considered to be installed and operational, less than 50 work in production. The rest... are on an "extended vacation".

Vinnitsa:

What is Behind "Show-Place"?

At the "Terminal" association, the first industrial robots appeared about five years ago. Now there are more than 170 of them, including 72, that were implemented last year, and about 30, implemented this year. So far, no other enterprise in the oblast can boast of such pace in mastering robotics technology. All seems to be good. But those at the "Terminal" have a different opinion. They think, that further increase in the quantity of "fashionable" hardware and systems carries the threat of producing a negative effect: decreased, rather than increased, productivity and increased products cost.

USSR Minpribor [Ministry of Instrument Making, Automation Equipment and Control Systems], who "Terminal" reports to, first demanded only one thing: quantity. So the association was buying robots and installing them, whether or not they were needed. But when the efficiency of what had been done was analyzed, it turned out, that during the first three years (they are ironically called here "'show-place' time") robots were losing money, and it was not until the last year, that savings of 41,000 rubles were realized and 19 people were conditionally freed up.

In a word, robotics complexes turned out to be inefficient. During the examination, some of them, such as those in the printed circuit boards machining shop and in shipping, were not working at all. And even though the "'show-place' time" is kind of over, its influence still shows: new equipment works only one shift a day and is busy only half the time.

A similar problem - how to keep a robot busy - was encountered at the electrotechnical plant. Thus, for instance, in the stamping shop, that makes dozens of types of small and large items, two robotics complexes have been recently installed. So far, they have been adjusted for stamping an impeller and an electrical motor switch clamp. They produce a monthly quota in a week.

When we asked in the foundry, why a robot was "on vacation", the answer was: because there is no metal. It is scheduled to be delivered only at the end of the year. And a foundry robot cost the plant over 30,000 rubles...

Sumy:

Together With "House Help"

A little bit over a year ago, a robotics complexes department was organized in shop No 11 of Konotop "Krasnyy metallist" plant. The complexes "were given an assignment" to perform stamping operations, the most monotonous and hazardous.

Behind the words "were given an assignment" is a large amount of work by enterprise engineers, who, in cooperation with scientists of the Donetsk division of "Giprouglyeavtomatizatsiya" industry sector institute, brough to life robots with, so to speak, truncated configuration. The plant personnel had to invent and modify, as they saw fit and at no small expense, loading, orientation and receiving devices, electropneumatic automation equipment therefor, dies and other equipment. They did not spare effort and money to debug the equipment, assuming, that the expenditures will pay for themselves many times over, when the machines will take over from manual labor.

But... A press, that was before operated by one female operator, became "covered" with highly sophisticated equipment, and, as is well known, servicing and maintaining this equipment is not cheap. To be sure, the expenditures would have been economically justified, had the unit with electronic brains and mechanical arms started working faster, than an operator. However, its productivity is exactly half of that of a press operator, that works next to it.

Freeing up several operators is quite an achievement in itself. But another thing is indisputable either. Robotization is linked not only to improving labor conditions, but also to improving economical parameters. Workers have many times gave engineers their ideas as to how to increase manipulators RPMs. But, according to professionals, this is hard to do technically. However, it has not occurred to professionals, that one should try to get increased return from even "slowed down" first-generation robots by increasing the up-time to the maximum. So out of 11 available complexes, only three work two shifts a day.

In a small-scale production environment, it is not a simple task to provide full load for a robot, that has not been adapted to fast readjustment. But today one talks of switching to three shifts a day operation. However, those in the plant do not give it a thought, so robots only work one shift a day. And in addition, professionals of the robotics complexes bureau at the chief manufacturing engineer department are not solving the problem of developing fixtures for expanded product nomenclature.

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ROBOTICS

QUALITY CONTROL SYSTEM FOR ROBOTS DURING ASSEMBLY

Moscow MOSKOVSKAYA PRAVDA in Russian 1 Aug 86 P 1

[Article by M. Danishevskaya under the "Science to Production" rubric: "Reliable Robot"]

> [Text] Scientists of the capital, that participate in the interindustrial scientific-technical complex [MNTK] "Robot", began developing a unique system for quality control of robots during assembly at the "Krasnyy prolyetariy" machine tools building plant imeni Yefremov.

Employees of robotics systems reliability laboratory became plenipotentiaries of designers and researchers in the enterprise shops. The laboratory was organized directly at the plant by the Machine Science Institute imeni A.A. Blagonravov, AN SSSR. Constant interaction with production personnel makes it possible for scientists to more accurately determine directions of search and more effectively implement innovations. At first, local problems were solved, that were related to prolonging life of individual subassemblies and parts and to quality control of each robot manufacturing and assembly. Today, when the conveyor of the robot building industry is gaining momentum, scientists seek to improve the entire system for quality control and diagnostics of manufactured equipment. It is clear, that successful widespread implementation of robotics complexes at customers' enterprises will depend on the quality of these new products.

In addition to methods, that have already become customary and traditional, professionals proposed to develop a computer-based universal system for control of basic parameters of manipulators. The system can "examine" a robot on-line and determine its compliance with requirements in a corresponding program. Such complex will considerably speed up final quality control and strengthen automatons reliability and longevity warranties, issued by the plant to its customers.

After the system will have been run in, enterprises, that implement robotics technology, will be able to use it too: the system is also capable of watching the condition of a unit in operation.

This is one of important trends in the MNTK "Robot" program. Scientists from the Machine Science Institute, ENIMS [Experimental Scientific Research Institute of Metal-Cutting Machine Tools], MVTU [Moscow Higher Technical School] imeni N.E. Bauman and other organizations help organize series production of robotic equipment, make it truly up-to-date, reliable, ready for both stand-alone operation and for application in flexible manufacturing systems.

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ROBOTICS

WORK ON APPLICATIONS OF RESONANCE DEVELOPED

Frunze SOVETSKAYA KIRGIZIYA in Russian No 243, 16 Oct 86 p 3

[Article by G. Afanas'yev]

[Excerpt] Scientists of the USSR Academy of Sciences' Institute of Machine Studies have come up with a splendid idea for making use of the phenomenon of resonance.

A test prototype of a resonance robot has been developed at the institute. Called "Mars" it uses only one-ninth as much power as a conventional series-produced robot of the same capacity.

One would think that resonance robots should have rapidly displaced their conventional counterparts from plant workshops--just like at one time economical diesel and electric locomotives displaced steam locomotives. But this has not yet happened. What is more, skeptics have appeared who assert that resonance manipulators are too delicate and troublesome, and work well only in laboratory conditions.

"The usual excuse, which happens with many innovations," retorted engineer-designer Nikolay Kryukov, who heads a group of developers of resonance robots at the Moscow machine-tool plant "Krasnyy proletariy."

"Just like any mechanisms, resonance robots have their characteristics which determine their area of use. They are primarily the simplest and most common robot manipulators which are used in stamping, welding and some other industries. Here the loads handled are often small, which is just what is needed for a resonance robot.

"Then there is a class of robots which operate on a self-contained power supply in places where it is difficult to supply power, such as under water. Here the use of resonance manipulators with low power consumption is also justified, even though more complex and costly control systems are needed.

"And, finally, what is most promising are hybrid robots, in which some components operate conventionally, while others work on the resonance principle. Thus, one of the products developed by the design bureau of the 'Krasnyy proletariy' plant is just such a unit: the 'hand'-rotation element for a currently series-produced robot. In short, resonance robots are just beginning to make their way into industry, and it will still take some time before they will become widely used."

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ROBOTICS

IMPROVED MECHANISMS FOR ROBOTS

Vilnius SOVETSKAYA LITVA in Russian No 246, 24 Oct 86 p 4

[Excerpt] Specialists of the Kaunas Polytechnical Institute (KPI) have designed a series of mechanisms which open up broad possibilities for development of new-generation technology and automated production sections and shops.

New industrial robots are intended for automating auxiliary manual work, others are for producing precision parts, while still others will become indispensable in dyeing shops. As compared with robots now in use, the new ones manipulate more quickly and flexibly and with greater precision.

"The very complex problem of providing the robots' actuating systems with capabilities that can more nearly match those of their control systems has been solved in collaboration with specialists of KPI's chair of automation," said Yuzas Rudzyanskis, docent of the institute's chair of machine tools. "As a result, the robots now carry out commands better and move along more complex paths. This is very important from the standpoint of preparing them for operation in flexible production systems and automated sections."

A series of components for industrial measuring robots has been designed under the direction of Professor Ramutis Bantsyavichyus at the institute. These robots will monitor parameters of sophisticated instruments and precision machinery, taking the place of tens of thousands of people who are now engaged in measuring work.

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ROBOTICS

ROBOT PRODUCER INTRODUCES AUTOMATED QUALITY-ASSURANCE SYSTEM

Moscow MOSKOVSKAYA PRAVDA in Russian No 232, 10 Oct 86 p 1

[Text] A computer has come to the aid of specialists of the "Krasnyy Proletariy" machine-tool plant who are studying questions of heightening the reliability and quality of robot technology.

The decision has been made here to create a whole computerized system which will make it possible to inspect many parameters of robots as they are being assembled. Scientists of the USSR Academy of Sciences' Institute of Machine Studies imeni Blagonravov are helping the plant's specialists in this difficult work. Through cooperation the scientists and the innovators at the machine-tool plant not only are accomplishing complex tasks for developing and introducing the system, but they are also amassing experience necessary for its broad use in machine building. The problem is one not only of checking the quality of robots as they are being assembled but also of inspecting the condition of their assemblies in operation.

Associates of the institute and specialists of the "Krasnyy Proletariy" plant are working together in a laboratory for problems of the reliability of robotic systems. Specialists of this laboratory are now solving a number of other problems connected with improvement of industrial manipulators that the plant is already producing, and with introducing new, improved and more reliable equipment into production. Work in preparation for experimental and subsequently industrial production of robots with a number of fundamental differences from existing models is being done through the joint efforts of scientists and industrial specialists.

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PROCESS CONTROLS AND AUTOMATION ELECTRONICS

SCHOOL PROJECTS IN COMPUTERIZED MACHINE DIAGNOSTICS

Moscow TEKHNIKA I NAUKA in Russian No 7, Jul 86, pp 11-13

[Article by A. Solodskiy, Rostov-on-Don, under the "Science to Industry, Bringing to Life the Resolutions of the 27th Congress of the CPSU" rubric: "The Lathe and the Computer: Practical Projects on the College Level for Future Factory Automation Specialists"]

> [Text] "To adopt measures for substantial improvement in utilization of the scientific potential on the college level..."--From the Basic Trends in Economic and Social Development of the USSR for the years 1986-1990 and up to the year 2000.

In the laboratory of industrial electronics of the Rostov Institute of Agricultural Machinery, alongside the Elektronika-60 microcomputer the ordinary lathe has found a home.

According to senior scientist of the Department of Industrial Process Automation (APP) of the institute A. N. Tkachenko, this conjunction of computer and lathe is no accident: "we are giving metal-working tools organs of hearing by means of the computer."

What does this imply? It turns out that this department is creating fundamentally new methods of diagnostics and control of the metal cutting technology through microelectronic techniques. And this is one of the lines of development of flexible automated industries (GAP). And the GAP is the answer to such urgent problems as the automation of many spheres of industrial activity and the freeing up of a large number of machine attendance personnel.

GAP require the latest process technology, microprocessors and robots. Such teamwork of computer technology, microelectronics, instrument design and mechanical design allows, not only an automation, but also a flexibility of production, mobility and universality, and the ability of quick conversion to a new product line.

However, the reliability of parts and assemblies of the exceedingly complex equipment for such automated factories of the near future can only be assured

with preventive maintenance, which, in turn, requires the adoption and use of modern equipment for diagnostics and monitoring of the behavior of machines and mechanisms, electronics, and automation. The reliability of an automated production is largely dependent on the proper use of the computers and the microprocessors. The electronic "watchdog" must efficiently recognize and correct misalignment or fracture of the tools and select the optimal alternatives to avoid breakdown of the expensive machinery.

The scholars of the department of APP of the Rostov Institute of Agricultural Machinery are specializing in this totally new field of engineering and science--mechanotronics (mechanics with electronics).

As far back as the 1960's, efforts were pursued here to simulate models of automated equipment. But a successful outcome demanded much time and many laboratory experiments and trial solutions. In the first place, it became necessary to abandon the previous views concerning the process of metal working by cutting. Moreover, the actual psychology of scientific engineering thought was itself modified. For in the age of electronics, the machinery in a comprehensive automated setting is endowed with "artificial intelligence" and such "behavioral" traits as were not even suspected heretofore.

And so it came to pass that, during a fortuitous "dialog" between lathe equipment and the computer, a situation occurred in which the individual components of the lathe suddenly "spoke up": they assumed the uncharacteristic role (as was formerly believed) of sources of information concerning the particular technological process. On the basis of the electronic data it was discovered that the mechanical part of the lathe furnishes information as to the "well being" of the cutting tool under its operating conditions.

This gave rise to the idea of creating a unique system of metal working diagnostics by means of the computer and microprocessors. In parallel with this, the department of APP (which has been headed since 1982 by doctor of technical sciences V. L. Zakovorotnyy, winner of the State Prize of the Ukrainian SSR) had been studying various physical effects accompanying the process of cutting, in particular, vibro-acoustic emission (VAE) (footnote *) (The phenomenon of acoustic emission and its utilization has been discussed in the article "The Cry of Tin" in this journal, No. 6, 1986), and the thorough investigation concluded with construction of an information model of the behavior of a working lathe. Prof. Zakovorotnyy relates:

We have investigated the forces which act on a cutter, and the oscillations excited by them in a broad frequency range, which assisted in the development of fundamentally new methods of analysis of the metal-working processes. The essence of our diagnostics and automatic metalworking control instruments and devices, which are protected by many inventor's certificates in the USSR, is a comprehensive analysis and disclosure of the unique properties and dynamism of physical effects as sources of information....

Among the hefty contingent of practical projects of the Rostov students are designs of different purpose and function. Thus, for example, there is a

device to determine the instant a cutting tool touches the work (inventor's certificate No. 1077768) in adaptive lathe control systems.

Diagnostic instruments based on the use of a VAE signal which are similar to these designs have the drawback of poor noise immunity. To offset this, a number of methods have been proposed, extracting the information about the operation of the lathe through various filters.

The Rostov students took a different route. Their method of optimization of the information signal in any given noise environment of the lathe enlarges the spectrum of supplementary information channels. The high reliability of the instrument also assures observance of the safety rules and a failsafe operation of the lathe fleet.

In the past five year period, the members of the department have built and introduced at enterprises around the country dozens of devices for diagnostics of the processes of metal-working, wear and fracture of cutting tools, and control of the quality of fabrication of parts on lathe equipment. Thus, e.g., a routine tool wear check has been adopted by the Tagan Rog Combine Plant. The annual income from using a single diagnostic device amounted to 7000 rubles.

The increased demands of industry and the progress in computer technology have compelled the Rostov students to deal directly with the assessment and prevention of critical situations on NC machine tools. As a matter of fact, the VAE signal employed in their instruments was propagated with large dispersion and stationary random amplitudes. It was necessary to enhance the precision of the cutting tool wear measurement in the case of machining of intricate parts. And, in parallel with this, the technological capabilities of the device should be increased.

In creative collaboration with industrialists, the department built a device to monitor the process of machining on NC lathes--Diagnostika-02 (inventor's certificate No. 1177135) to prevent emergency situations in event of malfunction within the system of the lathe or the robot, breakdown of the cutting tool, or operator error.

This design incorporates an electronic assembly, a light beacon and a cable for connection to the NC system. But its operating principle is based on a joint analysis of the VAE signal of the cutting zone and information from the NC system of the lathe, acquired by means of special piezotransmitters with built-in amplifiers.

Just how does Diagnostika-02 operate in a certain critical situation? In cases when the feeding of the blank is delayed or when the tool cuts into the work and is completely disabled, the reaction of the device is always the same: a signal is instantly sent to switch off the machine. And the light beacon instantly alerts the set-up operator.

A test lot of such devices for NC lathes has already been produced. By the end of the present year, Diagnostika-02 will be manufactured in series. The

anticipated economic impact from its introduction in machine building is hundreds of thousands of rubles.

For the purpose of controlling the reliability of the complex processes of metal-cutting by the noncontact technique, the department has designed a specialized lathe for drilling small-diameter openings in difficult-to-machine materials. For example, in the very same stainless steels [as above?].

The new lathe is equipped with a dual automatic control system (SAU)--one channel for torque and one for the parameters of ultrasonic vibrations in the cutting zone on the rotating tool. The tuning is done by a digital-to-analog converter (TsAP) of current. Another TsAP of voltage takes care of adjusting the speed of rotation of the spindle.

The result is guaranteed normal operation of the lathe and stabilization of the entire technological process. Since the overall force balance on the tool is reduced, its durability is increased. Practical adoption of the lathe has enabled an elimination of tool fracture and a twofold increase in labor productivity. Hence, the rather large economic effectiveness of the project, which has been set at 40,000 rubles.

The noncontact methods of extracting information during drilling of openings that have been proposed by the Rostov scholars, and the diagnostic devices built from them, have been accepted in the current year for adoption by the fuel equipment enterprises of the Ministry of Tractor and Farm Machinery.

We know what a troublesome and urgent problem is the fact that the lifetimes of the individual equipment components are much shorter than the overall machine resource. For example, the longevity of the distribution shaft of the Zhiguli is 5-7 times less than the running time of the motor vehicle itself up to the major overhaul. Again, this prompted the Rostov students to experiment with devices capable of predicting the quality of shape of a machined blank and of controlling the technological "heredity" of the parts during their fabrication.

G. G. Palagnyuk, docent and candidate of technical sciences:

Devices for automatic selection and maintenance of optimal cutting conditions for GAP are being built in cooperation with the Research Institute for Technology of Tractor and Farm Machine Construction (Moscow). These not only protect the tool against fracture in critical situations, but also assure prearranged qualities and a high operational dependability to the finished products. In principle, it is a question of the automotive engineer of the near future for lathe equipment with automated adjustable drive unit....

According to the estimates of the specialists, wholesale adoption of progressive inventions in the conversion to flexible technologies of the farm machine enterprises alone promises an economic impact of several millions of rubles.

One is irresistibly impressed by the scale of the engineering and scientific research of the Rostov students and its time frame--from the conception of the experiment to the immediate prototypes, suitable for construction of machines, lathes or instruments. Some of them are even applicable to medicine and public health.

It is of course no secret that the process of introduction involves no few difficulties. Regrettably, a scornful attitude toward college-level science still prevails at other ministries, agencies, and enterprises. But where there is an atmosphere of understanding, both parties--the industrialist and the student--will benefit.

In the current year, by commission of the Gosplan and the GKNT SSSR [State Committee on Science and Technology of the USSR], the Academy of Sciences, and the Ministry of Higher Institutes of Learning of the USSR and the RSFSR, the department is intensively working on hardware and software systems for control of lathe operations. A comprehensive program has been developed for the Ministry of Tractor and Farm Machinery, encompassing the research and development, training of specialists for the sector, and modern resources.

As recently as the previous five year period, the department and the institute (on balance one of the primary college-level institutes in the Northern Caucasus Science Center) have modernized the academic process in conformity with the latest progress in Soviet electronics and robot technology, mechanotronics and flexible technologies. The adaptation of the learning process of the students to the topical problems of production in the context of the accelerating scientific and technological revolution enabled the department to pick out budding top-flight researchers from among the graduates and add them to its staff, boosting the creative potential.

There is a painstaking attitude here to the future generation, and capable young scientists are met halfway. Quite a lot of inventor's certificates, ideas and concepts have come from the young co-workers--A. N. Tkachenko, G. A. Kozik, Yu. I. Udalov and Ye. V. Bordachev.

"It is our intention to convert to purely software diagnostic facilities--Anatoliy Tkachenko confided to me--to enhance the effectiveness of the microprocessor equipment without modification and to target the latter on specific products. The actual experience of underutilization of microcomputers in robotized machine tool production lines prompted us to use a temporarily activated computer for automated control of the part machining processes with increased efficiency."

The tremendous advantage offered by widespread adoption of such progressive innovations in the conversion to flexible technologies is obvious: in machine construction alone, such technologies can reduce the labor intensity of operations by a factor of 5, the number of attending personnel by a factor of 3, and the time frame and cost of retooling by nearly twofold. And it is in such context where diagnostics and enhanced reliability of the machining centers, and automation of their control and retooling, is an essential

factor for the functioning and increase in effectiveness of GAP in the USSR economy.

In the coming five year period, the practical projects of college students will find a wider reception at the leading machine-building enterprises, and not only in this sector. They have well demonstrated their worth and are crucially needed by such enterprises where integrated automation is keeping pace with modern scientific and technical progress. And indeed, the duty of the student in the modern day is to further such progress in every way and to vigorously respond to the demands of economics, as is being done by the members of the department of industrial process automation of the Rostov Institute of Farm Machinery, who are giving a successful start in life to promising innovations of mechanotronics.

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TECHNOLOGY PLANNING AND MANAGEMENT AUTOMATION

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CERTIFICATION, UPGRADING OF JOB SLOTS, LACK OF UNIFORM PLANNING DISCUSSED

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[Article by M.A. Tumasyan, candidate of economic sciences: "Certification and Streamlining of Job Slots"]

[Text] The certification and streamlining of job slots are under way at many industrial enterprises; this makes it possible to improve the quality of work, to improve the utilization of fixed capital and to lower the cost and ensure the output of a specific quantity and quality of products with the constant improvement of the equipment and production process and an increase in the equipment operation shift coefficient. Positive experience along this line has been gained at a number of enterprises of Minselkhozmash [Ministry of Tractor and Agricultural Machine Building], where, based on the "Statute on the Certification of Job Slots for Their Conformity to Progressive Solutions", in only three years 30,000 job slots have been cancelled, and more than 8000 workers were tentatively released in 1985 alone.

At the enterprises of another sector, more than 5000 job slots were cancelled and 21,000 square meters of production space were freed, and more than 4000 pieces of equipment were dismantled, including equipment not provided with labor resources. This has been conducive to achieving a balance of job slots and labor resources, a growth in labor productivity, an increase in the output-capital ratio, and a reduction in charges for capital. Thus, it is possible to think with total justification that intensive methods of management have been found in the sector's economy. For example, 112 low-efficiency job slots were eliminated and it was decided to utilize the equipment by an additional 8 to 20 percent in the Moscow Electric Lamp Plant Association as the result of the certification and streamlining of job slots. In addition, more than 100 pieces of equipment were dismantled and sold, and 542.5 square meters of production space were freed. The equipment operation shift coefficient in the current five-year plan period will equal 1.62, and the level of the capital-output ratio will increase by 15 to 20 percent.

Deserving of attention is the experience of carrying out the certification and streamlining of job slots at enterprises of Minelektrotekhprom [Ministry of the Electrical Equipment Industry and Power Machine Building], where the advanced know-how of enterprises of various branches of industry was utilized in the preparation of industrywide recommendations. Fundamentally new

guidelines conforming to the requirements for the intensive development of the ministry's subindustries were developed as the result of critical analysis of this know-how. Low-efficiency job slots were eliminated (about 5 percent) and about 80,000 square meters of production space will be freed.

The Leningrad Elektrosila Production Electrical Machine Building Association imeni S.M. Kirov and the following plants have achieved definite successes along this line: the Kharkov Elektrotyazhmash [Heavy Electrical Machine Building Plant] imeni V.I. Lenin, the Novokakhovsk Electrical Machine Building Plant imeni the 50th Anniversary of the Great October Socialist Revolution, the Zaporozhye Transformer Plant, etc. About 3000 workers were tentatively released at these plants, labor productivity increased by 4.2 percent, the capital-output ratio increased, and the wage fund was economized on. The collectives of these enterprises worked for two or three days on the saved raw and semifinished materials. These successes were achieved because of the development of a normative base for each kind of equipment and an efficient production process and the development of standards for individual kinds of products, which increased the efficiency of work relating to the certification and streamlining of job slots. Staffs headed by the ministers have been formed at ministries, whose tasks include constant supervision of certification progress and rendering assistance to associations in this.

Other ministries and departments are also, but with less success, doing work on the certification and streamlining of job slots. For example, definite successes have also been achieved at the Moscow Metalloplastmass Production Association. But the efficiency of this work could be higher if the enterprise were furnished with the appropriate norm-setting materials and standards for advanced production equipment and processes. After all, any ideal procedure for the certification of job slots can remain on paper if standards are not developed for the equipment and production process.

As far back as during the years of the first five-year plan periods, the need arose of constantly systematizing experience gained in the fabrication of machines and mechanisms and of developing certain rules for the design of production processes and methods of making calculations for them. Responsibility was established for the output of products of poor quality and for the nonobservance of standards by industrial enterprises, as well as of the production-process discipline at machine building plants; concrete measures were developed, aimed at enhancing the general and long-term development of machine building technology, the development of systematized and well organized production-process documentation, and improvement of the quality of products produced. In the last 10 to 15 years work in this area has slackened, which has been an obstacle in carrying out the certification and streamlining of job slots. It is necessary to develop systematized and well organized production-process documentation for each kind of product produced with the mandatory indication of the input of materials and labor for their manufacture.

The determination of the technical condition of equipment is no less important in carrying out the certification and streamlining of job slots. As studies conducted at the Scientific Research Institute of Labor have demonstrated,

the reason for equipment downtime is the lack of a technical diagnosis of its condition, which is often determined "by eye." For this reason, the administration and collective of each enterprise must remember that every non-working machine tool, machine or piece of equipment represents dead capital on the national economic balance sheet. Up to 2.5 percent of fixed capital is replaced annually, and more than 5 percent of the equipment becomes obsolete. Therefore, the correct determination of the technical condition of fixed capital is of a problematic nature. It is necessary, first, to increase 2- to 3-fold each year the extent of the modernization of equipment with a simultaneous improvement in maintenance and repairs on fixed capital, which will make it possible to extend their service life, and, secondly, to increase the percentage of capital investment aimed at the renovation of the active part of fixed capital by a temporary halt to the construction of small projects under the jurisdiction of industrial ministries and departments. The solution of this problem depends on the USSR Gosplan. It is also necessary to change the procedure for spending the production development fund, by directing it toward the solution of vital problems.

Experience in the certification and streamlining of job slots at enterprises of various industries has demonstrated that socioeconomic indicators are not operating to the full extent. For example, how is it possible to determine the level of the standardization of labor if labor input norms are not related to the intensity of the labor of an individual performer or collective? Existing methods of determining the progressiveness of labor norms do not always reflect the actual state of affairs in the area of the standardization of labor. The question arises whether the standardization of labor is based on a progressive or non-progressive method. After all, technically validated norms are developed in one case and the other. Therefore the level of the standardization of labor is also evaluated in terms of subjective factors. Industrial science and the USSR Gosstandart [State Committee for Standards] are guilty here. It must be recalled that work on the unification of the existing manufacturing process for a specific kind of product and of labor input was done every year prior to 1965. Norm-setting materials were developed based on the actual data and enterprises, having received them, endeavored to introduce them for themselves. It is obviously necessary to revive this practice. Furthermore, industrial science and the USSR Gosstandart should be working on the problems of the unification of norm-setting materials (industrial and interindustrial). Only with this will the certification and streamlining of jobs slots at enterprises achieve their goal. It is appropriate to mention that the USSR Gosstandart, in taking the place of ENIMS [Experimental Scientific Research Institute of Metal-Cutting Machine Tools], in place of the PPR [scheduled preventive maintenance] system developed a set of standards not needed by the repair services of enterprises, with the expenditure of not a little money and time. This kind of wastefulness must be combated.

The wider use of multimachine operation is no less important in the performance of the certification and streamlining of job slots. Of course, the problem of providing industrial enterprises with skilled personnel becomes more acute every year. For this reason the total or partial replacement of skilled workers in individual production processes by automatic machines is

a problem of first-level importance. The presence in industry of more than 100,000 general-purpose lathes and milling machines having manual control poses the question of how to use them more efficiently with a work force shortage. The Privod [Drive] special system, making it possible to control a group of general-purpose lathes or milling machines, was developed in 1974-1975. It won good recommendations at enterprises and its actual cost recovery period with two-shift operation equaled about 1.5 years, and labor productivity increased threefold when using the system in a line of four machine tools. It is possible to machine simultaneously identical parts of the panel, plate, cap, body, bracket, flange, base, etc., types on the model 676 milling machines equipped with the Privod-F system. Stepped outside and inside surfaces are machined on parts and drilling and boring operations are performed in mutually perpendicular planes. Thus, the capabilities of the Privod system are great, but the scale of its use in industry has remained unchanged.

Experience has demonstrated that for motives not understood interindustrial (industrial) recommendations on multimachine operation are being developed by economists without coordination with engineering specialists. As a result, these recommendation materials are of a general nature and do not achieve their goal. It is obvious that they should be issued by agencies of the USSR Goskomtrud [State Committee of the USSR Council of Ministers on Questions of Labor and Wages] in conjunction with the USSR GKNT [State Committee on Science and Technology], since the multiplaned work on the performance of the certification and streamlining of job slots should be of a constant nature and solve the set of problems associated with the intensification of production.

It is relatively easy at the present time to determine the status of working conditions and labor safety practices, since the Scientific Research Institute of Labor and other qualified organizations have developed norm-setting materials relating to this question. However, there are no instruments at enterprises for determining the noise level, the pollution level in the working environment, the moisture level, the dust content of the air, the vibration level, etc. As a result, the effectiveness of the utilization of norm-setting materials has been reduced to zero. Studies have demonstrated that enterprises report the need for these instruments every year, but they are not allotted. A number of machine building enterprises make these instruments themselves, which comes to three to five times more expensive, and their quality does not conform to today's requirements. Obviously, planning organizations must direct special attention to increasing the output of necessary measuring instruments.

The streamlining of job slots from the results of their certification for conformity with the modern achievements of engineering, technology and the scientific organization of labor, and the speeding of the improvement of the process of the certification and streamlining of job slots have taken on national economic importance.

There is one more artificially created barrier in this job--this is the large number of versions of instructions on planning, accounting and the

certification and streamlining of job slots and arbitrary forms for the generalization of results. This is associated with the fact that every sector of the national economy develops its own procedure. In 1985 the Moscow Institute of Economic Problems Relating to Integrated Development of the National Economy developed the "Procedural Recommendations for Generalization of the Results of the Certification and Streamlining of Job Slots in the Industry of the City of Moscow." However, the suggested reporting forms are superficial and do not make it possible to determine the percentage of the growth in labor productivity for the region as a whole in doing this job. The same institute in conjunction with the Labor Administration of the Mosgorispolkom [Executive Committee of the Moscow City Council of Labor Deputies] set up remote command stations for the gathering of data (rayon labor divisions) which, in turn, created from the personnel of plants and factories commissions for the gathering of data for the rayon. Obviously, this job again rested on the shoulders of the collectives of enterprises, bypassing the VPO's [all-Union production associations] and ministries of the hierarchy. Now the personnel of plants, for the results of the certification and streamlining of job slots, fill out not only ministry forms (23 horizontal columns and 12 vertical), but also forms developed by the institute (67 and 40 columns, respectively).

Thus, one more negative factor has appeared which lowers the efficiency of work on the certification and streamlining of job slots--this is the sluggishness of higher-level organs and the shifting of responsibility for this work. These negative factors are inflicting enormous damage on our State and are the consequence of the uninspired attitude of administrative agencies toward the job entrusted to them.

A great deal is being said and written about the certification of job slots, since it is one of the important factors in the intensification of production, but it is still not clear at the present time which government agency should coordinate this work. It is impossible to develop methods for the systematic utilization of internal and external potential without a single coordinating center.

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