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28 February 1984

USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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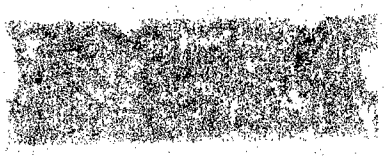

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USSR REPORT

MACHINE TOOLS AND METALWORKING EQUIPMENT

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INDUSTRY PLANNING AND ECONOMICS

MINISTRY OFFICIAL ON ECONOMIC EXPERIMENT IN MACHINEBUILDING INDUSTRY

Moscow IZVESTIYA in Russian 26 Dec 83 p 2

[Interview with R. N. Arutyunov, first deputy minister of heavy and transport machinebuilding, by V. Romanyuk; date and place not specified]

[Text] The role of heavy and transport machine building in our industry is an important one. The Ministry of Heavy and Transport Machine Building is equipping ferrous and nonferrous metallurgy, railroad transport and the branches of the fuel and energy complex with new facilities, machinery and equipment; and is thereby determining to a great deal the technical level of a number of the national economy's key branches.

Today, the machine builders are at the center of an economic experiment which is connected with expanding the rights of production associations and enterprises in their economic activity and with increasing their responsibility for work results.

R. N. Arutyunov, first deputy minister of heavy and transport machine building, answers an IZVESTIYA correspondent's questions.

[Question] Rafael' Nikolayevich, with what attitude are the heavy and transport machine building work collectives entering into the economic experiment?

[Answer] As is known, the progress in preparing for the economic experiment was recently reviewed in the CPSU Central Committee Politburo. Along with the work which has been done, omissions were also pointed out in the preparation for the experiment: A whole series of measures, which would contribute to the enterprises achieving higher technical and economic indicators in the near future, has not been carried out.

Taking into account the criticism that was addressed to us, we have defined a clear-cut strategy until the end of the preparatory period. Analyses of shop capacities have been completed in all enterprises. Specially created commissions are determing the "bottlenecks" and are taking organizational and

technical steps to eliminate them. There is a shortage of work personnel in the branches. We hope to cover it by perfecting the brigade form of labor organization and payment, expanding the multimachine-tool operator movement and introducing advanced equipment.

The specialists of the Novokramatorskiy Association have worked with initiative on the plan. Under the experiment conditions, the association received an opportunity to increase the production development fund more than threefold and use it to create specialized sections and to replace physically worn out equipment; part of the resources will go toward expanding the medical and welfare rooms of the Martenovskiy shop. Composite brigades of engineers and employees, which are filled with initiative, are engaged in adjusting the entire mechanism of the experiment.

[Question] The experiment guarantees for production associations and enterprises a situation in which the "earned" resources will not be withdrawn but will remain completely at the disposal of the collective. However, it is clear that the size of the resources must directly depend on the final work results. What do you primarily insert into this concept: final result?

[Answer] An important feature of the experiment is the fact that measures to improve planning and all economic activity are closely connected with accelerating scientific and technical progress in the national economy. All the benefits and conditions of the experiment will provide a return only if the machines are produced at the level of the best native and foreign models. This will be the final result. Quotas for new equipment (the first industrial series and test models) are now being included in the nomenclature plan for the production of the main types of products. This insures the coordination of the new equipment plan with the production plan and permits production preparations to be carried out in a timely fashion and the necessary materials and component parts to be ordered.

The entire question is how skilfully the technical and economic services of the enterprises prepare the programs for accelerating scientific and technical progress and for improving internal plant planning. Guided by the experiment, we intend to master hundreds of types of new equipment and modernize a considerable number of machines. "Modernization" is an unassuming word; however, in some cases it means increasing machine productivity 1.5-2-fold and in others -- doubling service life before overhaul. On the whole, the country will receive three billion rubles in savings during the five-year plan from the introduction of new equipment that has been created by the Ministry of Heavy and Transport Machine Building.

[Question] The experiment's conditions are expanding the boundaries for the initiative and independence of production associations and enterprises. In other words, they permit the technical and creative potential of a collective to be realized more fully. However, does this not mean that economic executives with the most initiative and the directors of enterprises with the best technical equipment will be able to enjoy its advantages to a greater degree?

[Answer] A collective at any level of development receives real benefits. Take only the rights of enterprises in using the wage and material incentive funds. Through savings in the wage fund, additional payments can be made within the limits of 16 to 24 percent to the tariff rates of workers for their professional skill and increases in the pay rate of engineers can be increased. Previously the maximum size of the pay rate for a skilled worker could reach 200 rubles; now, the "ceiling" has been raised to 250 rubles. This, of course, stimulates the development of initiative and a growth in the skill of workers. The engineer, technologist and section chief will receive a 50-percent supplement to their pay rate instead of the former 30 when there is an efficacious contribution to production.

The general director of the association has a right -- in accordance with the contract with the customer -- to establish on his own the prices and additional payments for test lots, semi-finished items and assemblies and items of internal branch demand and additional payments for improving individual technical and economic indicators of the machinery and equipment being manufactured; it is also permitted to employ additional incentive increases when products of the highest quality category are delivered for export.

Nevertheless, returning to the question that was asked, I would like to point out that the principles of the economic experiment are not meant to be automatically put into effect. The experiment must be supported by organizational and political work and by the thorough understanding of each worker and specialist of the new conditions and principles for stimulating highly productive and qualitative work. Where this exists, the activity of the people is higher. Quite a few suggestions for improving production planning have been born in progressive collectives. For example, blast-furnace, steel-furnace and rolling-mill equipment -- as well as the spare parts for it -- are being planned in tons and rubles; forging presses -- in pieces and rubles; and power-shovels -- in pieces and cubic meters of bucket capacity. It seems more reasonable to reduce everything to a single indicator.

The directors of the associations have also raised a whole series of questions that are connected with increasing the responsibility of the planning bodies for the quality of the plan. It happens that some extremely bulky items -- "5000" and "2000" machines -- are eliminated from the plan after significant expenditures on their production because of a change in the direction of capital investments. This leads to an increase in "unfinished production" and lowers economic indicators. Unfortunately, the situation regarding deliveries is not "aloof" from the customers. They can cancel the contract 45 days before the beginning of deliveries without any consequences for themselves -- and the manufacturer is the loser. For example, Moscow's "Transmash" has rejections totalling 600,000 rubles in 1983. What is the way out of this? It is to consider a concluded contract a firm one and not subject to any changes over the course of a year.

Taking into account the increased responsibility for deliveries, they are introducing in many enterprises of the branch an effective system for planning and

monitoring the fulfillment of contract commitments for each plant and shop. Computer centers have been created in 38 large associations. Operational and extremely effective control over the output of products is being exercised with their help.

True, far from all branch enterprises are completely fulfilling their delivery commitments. In a number of cases, the control system only fixes the lag but it is necessary that it prevent possible disruptions in the future. Matters must be arranged so that the output of items in the plant is carried out strictly in accordance with periods which insure the output of machinery in accordance with the signed contract.

[Question] The activity of a branch, which is operating under the conditions of the experiment, must be added to the management and economic relationship system that has taken shape. In your view, how should problems, which are at the junctions of inter-branch interests, be solved and what adjustments should be introduced into the work practices of planning and supply bodies?

[Answer] Let us begin with the fact that the inclusion of test models of new equipment in the nomenclature list of the main types of products requires the timely delivery of new component parts and materials from cooperating branches. The responsibility of USSR Gossnab territorial bodies for providing material and technical resources to associations and enterprises has been increased by a decree of the CPSU Central Committee and the USSR Council of Ministers. Centralized delivery of goods from the warehouses and bases of the material and technical supply territorial bodies in accordance with agreed schedules has been provided for by the experiment's conditions. Unfortunately, they are frequently being violated according to the practices which have taken shape.

Questions on balancing the plans have been the subject of discussion in the USSR Gosplan and the USSR Gossnab. Nevertheless there are misgivings that a train of several unsolved problems will extend into the experiment. For once, associations and enterprises have received in a compressed time funds for the major material and technical resources and -- together with USSR Gossnab bodies -- are completing their attachment. However, the amounts of the allotted funds for a number of positions do not insure the complete balancing of the production plan with material and technical resources. In particular, resources are required for doing the work which is being performed at the expense of the production development fund.

The planning of rolled metal savings requires improvement. Tasks must be established not only for an absolute decrease in expenditure norms but also considering the specific expenditure of metal per unit of equipment productivity.

Under the conditions of the economic experiment, the expansion of production and the improvement of the workers' social and living conditions will occur by performing this work in an economic way. In the meantime, unfortunately, the method of operations using the organization's own resources seemingly stands by itself when distributing resources. In our opinion, it is necessary

to give the method of operating using the organization's own resources equal rights with conventional construction jobs so that all materials are allotted according to the same norms to the contract organizations.

The preparations for the experiment have now entered the final stage. Training of shop personnel is being conducted. The development of internal shop norm documentation is ending. As was pointed out in the CPSU Central Committee Politburo, it is especially important now in organizational work to reach each worker. The decision to conduct a large-scale experiment in our branch is regarded in all collectives as a large vote of confidence by the party and the government. We will exert every effort to carry it out successfully.

8802
CSO: 1823/91

SLOW PROGRESS IN ECONOMIC EXPERIMENT DUE TO ORGANIZATIONAL PROBLEMS

Moscow SEL'SKAYA ZHIZN' in Russian 10 Dec 83 p 1

[Article: "In the CPSU Central Committee Politburo"]

[Text] During its regular plenary session, the CPSU Central Committee Politburo heard reports from F. A. Afanas'yev, the minister of heavy and transport machine building, and A. I. Mayorets, the minister of the electrical equipment industry, on the progress of preparations for the economic experiment to expand the rights of these ministries' enterprises in planning and economic activity and to increase their responsibility for work results. As was noted during the session, definite work has been done in this direction at the present time. The necessary methodological and norm documents have been approved. Production preparations for operating under the new conditions are being completed.

At the same time, it was pointed out during the session that the Ministry of Heavy and Transport Machine Building and the Ministry of Electrical Equipment Industry as well as the central economic bodies have still not carried out the entire series of measures which are aimed at conducting the experiment successfully and which contribute to the enterprises' achieving higher technical and economic indicators in a short time. Many of the enterprises have begun the experiment without working in the required way on questions of improving production efficiency, the technical level of the produced products and savings of all types of resources. The ministry collegiums are providing little concrete help to associations and enterprises. An appreciable reorientation of the work style of ministries and especially of all-union industrial associations has not occurred. The capabilities of work collectives to achieve higher indicators with the help of the new economic levers and incentives are also being restrained by shortomings in the activity of the technical and economic services in accelerating scientific and technical progress, improving internal plant planning and incorporating the brigade form of labor organization.

Some party committees still do not busy themselves enough with organizational and political work directed toward supporting the experiment and have not seen to it that each worker and specialist thoroughly understands the new conditions and principles for stimulating highly productive and qualitative work. Trade union and Komsomol organizations are being poorly involved in

this important task. The capabilities of the different forms of personnel economic and political training are not being fully used.

The Politburo directed the attention of the communist ministry directors to the serious gaps in the preparations for the experiment in the heavy and transport machine building and electrical equipment industry enterprises, and required them to concentrate their efforts on the complete and unconditional realization of the principles and propositions that are contained in the decrees of the CPSU Central Committee and the USSR Council of Ministers on this question. It was recommended that the necessary measures be taken to improve production planning in the enterprises that are participating in the experiment, to provide them with material and technical resources and to develop the initiative and interest of the work collectives.

The directors of the Ukrainian SSR Ministry of Food Industry, Belorussian SSR Ministry of Light Industry and Lithuanian SSR Ministry of Local Industry, whose enterprises have also begun to conduct the experiment, were instructed to review -- considering the experience of the Ministry of Heavy and Transport Machine Building and Ministry of Electrical Equipment Industry -- the readiness of their enterprises to conduct the economic experiment and to take all necessary steps to insure its successful execution.

The task of raising exactingness on economic directors and the party committees and party bureaus of the enterprises, which are conducting the experiment for the carrying out of specific measures to intensify production and strengthen executive and labor discipline and to see to it that the creative activity of the workers is directed primarily to the achievement of high final national economic results has been assigned to union republic communist party central committees and to party kraykoms and obkoms.

Proposals for further improving and systematizing legislation in the area of planning, logistics, finances, credit, industrial production and capital construction were examined and approved during the Politburo session.

The CPSU Central Committee Politburo discussed and approved the measures that were outlined by the USSR Council of Ministers to insure the fulfillment of the Soviet Union's obligations which result from the decisions of the 37th sitting of the Council for Economic Mutual Assistance session.

N. I. Ryzhkov's informational report on the results of a Soviet delegation's visit to the Polish People's Republic, during which important economic questions were examined and agreements aimed at futher deepening economic, scientific and technical cooperation between the USSR and the Polish People's Republic were signed, was heard.

Proposals for expanding the Soviet Union's trade and economic relations with Finland during 1986-1990 were approved.

Decisions on several other matters in the Soviet state's foreign and domestic policy were examined and adopted during the Politburo meeting.

8802
CSO: 1823/95

NEW PRODUCTION TECHNIQUES, NC LATHES RAISE PRODUCTIVITY

Yerevan KOMMUNIST in Russian 29 Nov 83 p 2

[Article by A. Marutyan, engineer: "Economics of Profitability"]

[Text] It is impossible to obtain a ton of finished products from a ton of metal in machinebuilding. Waste is unavoidable. Therefore, designers and technologists in the industry are faced with the problem: not only to reduce metal waste by turning it into chips but also raise the percentage of yield of the finished products by introducing progressive technology.

The most common bronze bushing is one that can be found in many products of machinebuilding, including metal-cutting machine tools. It was manufactured at the Yerevan Plant imeni F. Dzerzhinskiy by grinding from a rod or bar with a metal utilization coefficient of 0.7. A group of engineer at the enterprise undertook to change the manufacturing technology of the part and introduce the casting of the bushings with a minimum of metal losses. As a result, the metal utilization coefficient was increased to 0.98 with a net annual profit of 50,000 rubles.

Another example of raising production profitability is replacing outdated equipment by better equipment. Drilling, boring, face milling and other operations for manufacturing parts were done in the machine shop of the plant on 24 machine tools. Each machine tool is serviced by one worker. The 24 machine tools were replaced by four with numerical control, each of which executes six different operations. The new lathes have six operators instead of 24 turners. The production cost of parts dropped sharply and profitability increased.

The innovator proposals introduced have a great effect on profitability economics. Here is one of them. M. Grigor'yan, engineer-technologist, studied the differential functions of all four devices used for grinding the teeth of worm gears and integrated them into one. In other words, he simplified and made less expensive the processes for manufacturing the parts by designing one device with a diamond roller and introduced it. Productivity of labor tripled.

In the current five-year plan period, over 90 organizational-technical measures were implemented at the Plant imeni F. Dzerzhinskiy. These measures facilitated the successful fulfillment of the plans and reduced production costs by 14 percent as compared to 1980.

2291
CSO: 1823/80

OVERVIEW OF MACHINE TOOL DEVELOPMENT, TRADE IN CEMA COUNTRIES

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 10, Oct 83 pp 16-20

[Article by Igor Bochkarev (CEMA Secretariat), Ibragim Mansurov (USSR Ministry of Machine Tool and Tool Building Industry) and Vladimir Tarskiy (scientific-production association of the VNIIlitmash [not further identified], USSR), under the heading "Comprehensive Program In Action": "The Priority Directions of Machinebuilding"]

[Text] I. The Slogan: Technical Progress

In order to meet machinebuilding requirements, specialized CEMA member-nation enterprises are currently manufacturing practically every type of forge-press equipment (FPE). The production structure is constantly being improved. The number of automated multipurpose machines is being significantly increased. New equipment complexes and installations for metal-conserving technologies are being developed and mastered. The productivity, precision and reliability of FPE are being improved.

The production of new types of items is being mastered with a view towards obtaining precise blanks. Machinery and automated complexes are being produced in large lots for all technological subdivisions.

Retooling the national economy dictates the necessity of expanding the production of programmed-control machines. New designs are being developed for processing-center types of highly productive equipment. They permit a maximum concentration of a large number of operations in a single machine, ensure a reduction in servicing personnel and provide an opportunity to reduce production space. New type-sizes of multistation automatic sheet-stamping, cold- and hot-upsetting machines are being developed.

A higher product technical level is being achieved by providing equipment with means of automation and mechanization. Increasing use is being made of technological complexes using industrial robot-manipulators. Equipment unit power is being increased, as is the release of heavy-duty and single-purpose FPE for power and nuclear machinebuilding.

Interaction In the Area of Production, Science and Engineering

The international socialist division of labor, and in particular, the development of production specialization and cooperation and scientific-technical cooperation, plays a large role in the development of precision machinery at the world level.

This can be shown using specific examples. In 1979-1980, highly productive multistation automatic machine tools were developed through the joint efforts of designers and engineering-technical workers at the "Mekhpress" plant in Barnaul (USSR), the "Dzhyas" plant (CSSR) and the "Tseulenroda" plant (GDR). These machines were in the form of a large stamping center combining up to nine presses into a single complex. Mechanized tool replacement enabled us to use them not only in mass production, but also in small-series production, where the types of parts being manufactured frequently change.

These automatic multistation machines are widely used at enterprises of automotive, bearing, electrical equipment and electronics industry, in agricultural, food and consumer-goods machinebuilding, and in other branches. They are intended for the sequential stamping of parts out of roll sheet and rolled bar sheet, with automatic repositioning. Their productivity is 25 times higher than that for multipurpose presses which are loaded manually. [Photo of this machine reproduced on following page.]

One other highly productive machine designed by CSSR and USSR specialists and manufactured at the Narodnyy enterprise imeni Shmeral (CSSR) is the automatic multistation cold-upsetter combine, which enables us to fully automate the manufacture of complexly-shaped bolts with heads.

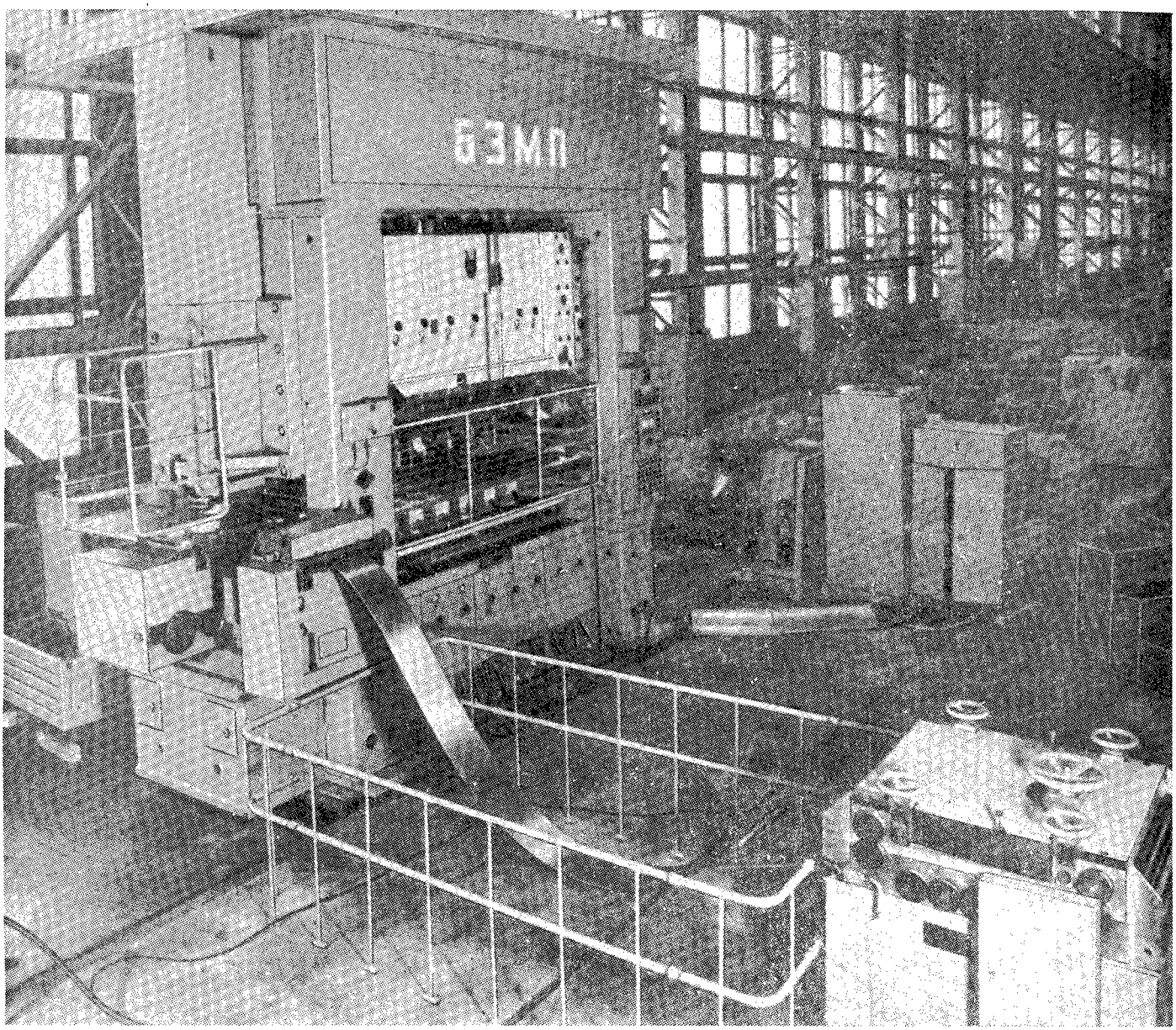
The production of a standard automated complex based on a 630-kH press has been set up to comprehensively automate multipurpose FPE through multilateral CEMA member-nation cooperation. The primary developer was the Azov SDB [special design bureau], and the primary manufacturer was the Salskiy Forge-Press Equipment Plant.

The exchange of technical documentation for and models of industrial robots is being developed more ant more. The release of automated press-based complexes equipped with them is being mastered.

Based On Agreements

Current CEMA member-nation interaction in developing and producing forge-press equipment is being developed under two agreements signed last in the last five-year plan. One, that of 11 December 1979, is aimed at broadening and deepening multilateral scientific-technical cooperation. The participant nations are the PRB (People's Republic of Bulgaria), HPR (Hungarian People's Republic), GDR, PPR (Polish People's Republic), USSR and CSSR. The agreement anticipates combining efforts to design sets of technological and transport modules for building automated adjustable sectors based on sheet-stamping equipment. Also outlined is improvement in the technological processes of cold and semi-hot displacement forming, research on lowering forge-press machinery noise and vibration, and research on a number of other pressing problems.

Multistation Automatic Sheet-Stamping Machine



There is a mutual exchange of information, parts types have been determined, and we have developed the circuitry for unitizing FPE and layout diagrams for the automated adjustable press complexes under these topics.

Scientific research and planning-design organizations of the GDR, USSR and CSSR are planning the development of modern, highly productive, precision FPE with single-design NPC meeting modern requirements for developing equipment in the field of pressure-working metal.

The participant countries agreed on a proposal to develop two new types of highly productive machines for working sheet materials, jig-turret presses (including ones using laser cutting devices), and a set of means of automating and mechanizing hot displacement stamping.

The second is an agreement on multilateral production specialization and cooperation dealing with multipurpose and automated forge-press machines, subassembly components and means of mechanizing and automating FPE, singed 12 September 1980 by the PRB, HPR, GDR, PPR, SRR (Socialist Republic of Romania), USSR, CSSR and SFRY (Socialist Federated Republic of Yugoslavia). It covers about 50 percent of the forge-press equipment being produced by CEMA member-nations. The agreement products list consists of 10 main technological groups of multipurpose and specialized machines in 426 type-sizes. A complex of measures to systematically raise the technical levels both of these machines and of the means of mechanizing and automating them was outlined.

In connection with the fact that this level significantly depends on the quality of the subassembly components (hydraulic and pneumatic devices, electronics, electrical equipment, instrumentation, bearings, and so on), specifications for the various materials and parts supplied were developed and transmitted to the appropriate branches.

The intention is to meet the requirements of these for forge-press equipment in terms of products list and quantity primarily through the development of multilateral production specialization and cooperation by CEMA member-nations. To do this, we must first of all:

master those machines in great demand and concentrate their production in 2-3 countries;

focus our efforts on the manufacture of unitized subassemblies, means of automation and mechanization, NPC systems, pneumatic control systems, and so forth.

About 70 specialized CEMA member-nation enterprises are now involved in resolving these tasks. A number of organizations in other branches have also been enlisted.

II. Broader Products List

Foundry production plays an important role in improving machinebuilding.

The current main tasks in this area are:

improving labor productivity, improving castings quality, lowering net cost, and maximum approximation of the finished product in terms of size and shape;

improving working conditions at enterprises and strengthening environmental protection measures;

introducing materials- and energy-saving technologies.

Foundry shops are now automating and comprehensively mechanizing production processes; complete technological equipment units and lines are being installed. They will enable us to obtain castings of iron, steel and nonferrous alloys, weighing a few hundred grams or many tons, from one-time sand molds.

The manufacture and reciprocal delivery of this latest equipment is anticipated in a multilateral agreement on international specialization in the production of complete technological lines and equipment for foundry shops and plants, signed 22 April 1977. It covers 114 type-sizes of complete technological lines. The protocol listing the equipment to be specialized has been expanded to 194 type-sizes.

Implementation of the agreement has led to production concentration. Today, more than 50 percent of the machinery is manufactured in one country. This has provided an opportunity to focus the efforts of the countries on technical improvements in the equipment being produced. As a result, the overwhelming majority of it is highly productive and is used to make very precise castings.

Among the specialized equipment are pressure-casting machines with cold and hot extrusion chambers and automated complexes based on these machines. We anticipate the release and reciprocal export of this equipment, with cut-off forces of up to 3,500 tons, which corresponds to the highest limited necessary in production. The complexes ensure the receipt of aluminum block castings, automobile engines, subway escalator step units, and so on. The complexes include, along with machines with automatic control systems, manipulators for removing castings from molds and other items.

We also plan to manufacture and deliver automated sets of equipment for counter-pressure casting. This equipment was developed by Bulgarian specialists for a precision process guaranteeing the receipt of highly precise castings and improvement in their physicomechanical properties.

An important sector for joint efforts is highly productive equipment to obtain precise chill-mold and centrifugal castings and iron and bronze section billets.

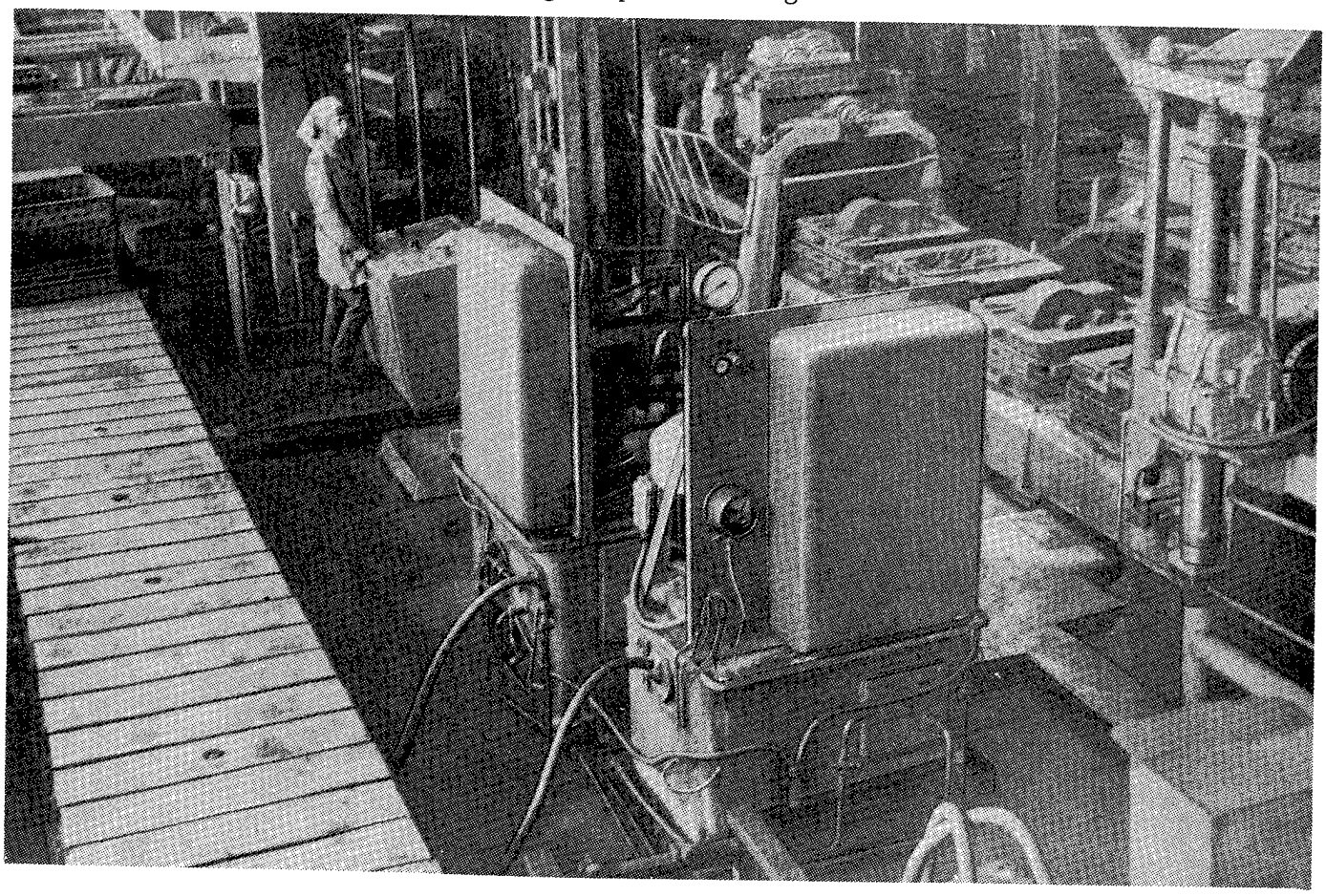
Unique automated equipment units for casting using meltable molds occupy a special place in the specialized equipment; their annual output is 400, 1,000 and 25,000 tons; they were developed and are being produced in the USSR.

Using them, one can obtain precision blanks of complex shapes and with clean surfaces in mass production in machinebuilding, instrument-making and other branches of industry. This process is used most widely in the manufacture of automobile, tractor, aircraft, bicycle, motorcycle, sewing machine and other parts.

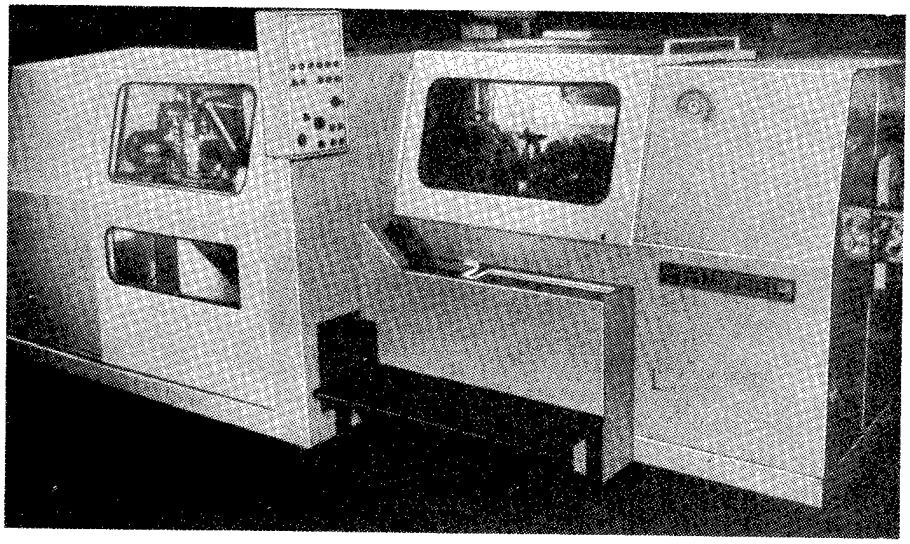
A whole series of fundamentally new design resolutions have been used in the creation of these complexes, thanks to which working conditions in foundry plants and shops have been radically improved. Some 80 percent of the technological operations in precision casting have been automated, which has freed many workers from difficult, monotonous labor.

In accordance with the agreement, CEMA member-nations have set up the release of a broad products list of core machines, including automatic lines for manufacturing cores out of chemically hardened mixtures, equipment for shotblast-cleaning castings and special casting methods, including continuous casting using high-strength iron, and others.

Automatic Line for Manufacturing Complex Castings



Automatic Combine



Policy of Automation

Scientific-technical cooperation based on the multilateral agreement of 12 January 1980 is currently being widely developed. Worked out in accordance with the LTCP [long-range target cooperation program] in the field of machinebuilding, it is aimed at creating and producing highly productive, precision equipment for foundry plants and shops.

With a view towards increasing production efficiency through joint efforts, the PRB, HPR, GDR, PPR, SRR, USSR and CSSR are now developing the following types of very new equipment to obtain precise blanks:

automated equipment for preparing self-hardening mixtures (coordinating country -- GDR);

automatic computer-controlled lines for manufacturing castings in single-use sand molds (coordinating country -- USSR);

automatic lines for manufacturing cores, with the technological process and tool replacement being controlled by computer (coordinating country -- GDR);

automatic equipment for the continuous casting of section blanks (coordinating country -- GDR).

The technical level of these machines will correspond to the world level.

As compared with those being produced now, the new mixers will be designed to be less materials- and energy-intensive. Expenditures of binders and the labor-intensiveness of cleaning the mixing chamber will be reduced. The servicing zone has been expanded. The control system has been improved.

Lines operating with computer assistance ensure higher quality casting than lines with an electronic control system. Moreover, their productivity is 10 percent higher. The use of programmable instruction units (microcomputers) enables us to lower the cost of developing and manufacturing control systems and to reduce the time involved in adjusting the machines.

We plan to create equipment with fully automated production processes for the continuous casting of section blanks. In this application, it will enable us to save 30-40 percent of the metal as compared with the use of one-time sand molds to obtain similar castings.

New Tasks

Participant countries in the 12 January 1980 agreement have now reached agreement on supplementing it with the tasks of developing complete sets of highly productive automated and mechanized foundry equipment for the manufacture of precision castings using meltable forms.

The necessity for medium- and large-diameter castings of this type arose in connection with the development of gas turbine compressor manufacturing and turbine manufacturing for power engineering.

The development and creation of such units for mass production will enable us to:

obtain castings close to the finished parts;

reduce machining to a minimum and reduce the machine tool pool two-fold;

reduce job labor-intensiveness by 20-25 percent;

lower expenditures of scarce, expensive supplemental materials by 25-30 percent and of the electric power used to manufacture one ton of castings by 20 percent;

improve product quality through full automation of individual operations and subdivisions;

reduce defects by 20-25 percent.

The development and creation of complete units for series and small-series production will provide an opportunity to:

lower the cost of a ton of finished castings by 8-10 percent;

reduce the labor-intensiveness of their manufacture by 15-20 percent and machining by 30-40 percent;

increase surface cleanness and casting precision by one class;

lower expenditures of electric power in manufacturing one ton of castings by 20 percent;

reduce the number of workers employed;

free the machine tool pool for machining.

Work is being done in this particular area both under national plans and also under programs for cooperation within the CEMA framework. Their actualization helps implement specific measures invloving the development and creation of highly productive precision metalworking and foundry equipment and the development of its specialized and consolidated production in 1982-1985 and up to 1990, as approved at the 102nd meeting of the CEMA Executive Committee.

11052
CSO: 1823/52

EVOLUTION, MODERATION OF URALMASH REVIEWED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 Jul 83 p 1

[Article: "The Plant of Plants: Today Is Uralmash's 50th Anniversary"]

[Text] Hundreds of congratulatory telegrams and letters addressed to the "Father of Plants and Factories" are arriving these days. The miners of Yakutiya thanked the machinery builders for one of the world's most powerful open-pit excavators and reported that with the aid of the EKG-20 excavator a crew headed by V. Ygorov, recipient of the "Miner's Glory" decoration, dug out more than 2 million cubic meters of earth. A message came from the Kil'skiy superdeep oil well project that a record mark had been reached using a Uralmash drilling rig--a depth of more than 11,500 m had been achieved and drilling is continuing. The very first product of this enterprise--"guns" for plugging blast furnace tap holes--look quite modest alongside these giants. But at that time these machines were purchased in Germany and were built in the Krupp plants. The Uralmash workers issued a challenge: "We can build them better than Krupp." And they did. In the thirties Uralmash delivered powerful rolling mills to the "Serp i Molot" Plant in Moscow, to "Zaporozhstal," "Amurstal" and many other enterprises, fabricated equipment for 18 blast furnaces that smelted half of all the iron in the country. The plant collective matured, gained experience, and learned to solve by themselves complex technical problems and develop their own machines. And their knowledge, skills and dedication were soon to be demonstrated in full measure. Within a week after the war started Uralmash received a government assignment: initiate the production of bodies for heavy tanks. The plant collective required only 2 weeks to develop the technology and construct the production line. Hundreds of tanks moved down the line and were outfitted for delivery of the new product. In the war years the Uralmash personnel demonstrated their mettle in many ways. One representative of the "Tysyachnikov" [production record setting] movement, A. Chugunov, fulfilled his 2-year production norms in only 2 months. P. Oberyukhtin, a toolmaker, fulfilled his production norms by 3,660 percent. The brigade headed by D. Sidorovskiy, steel worker and Hero of Socialist Labor, increased by several fold their output of metal for combat machines. This was the birthplace of the first "Komsomol Frontline Brigade," headed by M. Popov. At the initiative of lathe operator P. Spekhov the experienced workers undertook the training of the young apprentices, working together as

an integrated team. This made it possible in a short time to make up for the shortage of skilled workers and supply the war front with equipment. It is not just by chance that many military decorations appear on the Uralmash banner. In memory of this tumultuous period the last self-propelled artillery piece, produced on Victory Day, was placed on a pedestal. And the great labor traditions are still alive today in the plant collective. Competing in the program for a fitting celebration of the 50th anniversary of the birth of their own enterprise, the brigade of machine operators headed by Anatoliy Maksimovich Korolev, member of the CPSU Central Committee, fulfilled their 3-year plan a month ago. Today hundreds of production collectives are similarly overfulfilling their plans each week and achieving a smooth rhythm in their work.

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SERIES PRODUCTION OF ADVANCED COMPUTERS, PERIPHERALS

Moscow EKONOMICHESKAYA GAZETA in Russian No 26, Jun 83 p 2

[Article by N. Gorshov, deputy USSR minister of the radio industry: "EKONOMICHESKAYA GAZETA Responds"]

[Text] The Ministry of the Radio Industry has reviewed the critical comments presented in the survey: "From Microprocessors to OGAS [Statewide Automated System for the Collection and Processing of Information for Accounting, Planning and Control in the National Economy]," published in EKONOMICHESKAYA GAZETA. Programs have been implemented in the radio industry for improving the reliability, quality and technical level of the SVT [advanced computers] and for the development and series production of peripheral and terminal equipment. These programs have outlined the plans for the development and series production of more than 70 individual data input-output units and data processing devices, external memories, subscriber stations, terminal systems, and automated workplace complexes (more than 40 of these products will be introduced in 1983-1985). In addition the programs provide for measures directed toward improving the quality, reliability and technical level of the new peripheral units, and also further improvement in the level of their maintenance, reduction of the energy usage and material consumption, and broadening of the applied software program support. As for the comprehensive centralized servicing of the SVT, this plan is already in use for 60.4 percent of all the computers in operation nationwide by the Minradioprom enterprises. The previously mentioned "Program for Improving the Reliability, Quality and Technical Level of the SVT" outlined plans for complete satisfaction in 1983-1985 of the requests of the computer users for the conduct of operations associated with the introduction into operation of the YeS EVM [YeS computer series] hardware and the ARM [automated workstation] systems, and plans for increasing the rate of acceptance of computers for technical servicing to 80 percent in 1985. Several other measures are being taken to improve comprehensive centralized servicing of the SVT.

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BRIEFS

CONTRACTS WITH SWEDEN--The All-Union Foreign Trade Association "Prommashimport" has signed a contract with the Swedish firm Sandvik for delivery to the USSR of a number of special-purpose circular saws for the woodworking industry enterprises. K. Kasell, head of the Sandvik office in Moscow, said: "This is only one example of our business cooperation with our Soviet partners. We have contracts for the delivery to the Soviet Union of hard-alloy stools, steel and other articles. This year we have held in our office ten symposia for Soviet specialists, including symposia on the production and application of metal-cutting tools and equipment for the woodworking and other branches of industry. We have recently proposed to the Soviets new machine tool equipment which will make it possible to improve the productivity of both the conventional machine tools and the machining centers. We are also expanding our relations in the foodstuffs industry field. Sandvik is all for further progress in mutually favorable cooperation with our Soviet partners." [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 31, Jul 83 p 20] 9576

CSO: 1823/36

PRODUCTION OF UNMANNED MACHINING SYSTEMS AT SREDNEVOLGA PLANT

Moscow IZVESTIYA in Russian 4 Jul 83 p 1

[Article by E. Kondrator, IZVESTIYA special correspondent (Kuybyshev): "Machines Are Learning How to Think"]

[Text] The Srednevolga Machine Tool Construction Plant has initiated the development of new machine tools designed for "unmanned operation." The speciality of this enterprise, defined in the seventies, is the production of machine tools with computer numerical control (CNC). According to the plant manager E. Revinskiy, these machines now determine the complexion of the plant. The last 3 years have been a period of rapid introduction of the new technology in the enterprise. While 189 CNC machine tools were delivered to users in 1980, this year the plan calls for the delivery of 540.

What are the principal advantages of the new machine tools? The departments and shops equipped with these tools can operate as follows: debugging, programming and loading of the equipment are accomplished on the first shift; during the second and third shifts the entire automated complex operates on its own. Manual intervention is required only if some mechanism breaks down.

The Kiubyshev machine tool builders are developing metal-cutting machine tools that are able to operate not only following prespecified programs but also following programs that are prepared right in the shop, from conventional drawings. Using the console keyboard, the operator himself determines the most effective scheme for machining the part.

V. Moshnin, chief engineer of the plant, says: "Work directed toward the development of a fundamentally new machine tool that will form the basis of 'unmanned production' is in the planning stage. This machine embodies the latest advances in electronics and we expect that it will have a long working life. Experimental models will appear later this year."

The Srednevolga Machine Tool Plant is famous for its labor traditions. The movement with the slogan: "Quality assurance--from preliminary design to the finished article" was born here. The brigade of assemblers headed by Yu. Agafonov was the first brigade in the region to be awarded the title:

"Communist Labor Collective." The remarkable technology developed at this enterprise is helping to solve the very important problem of effective increase of labor productivity and general conservation of manpower resources. The highly automated machine tools which the plant is producing in the 11th Five Year Plan will reduce the number of machine tool operators required by 3500.

The enterprise has made a good start this year: the 5-month program was completed ahead of schedule, the sales were 850,000 rubles above the planned figure, and all the deliveries were on schedule.

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PRODUCTION OF FORGE PRESSES WITH CNC

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 6, Jun 83 pp 36-37

[Article by P. Borisenko and A. I. Belov, candidates of technical sciences: "The Effect of Increasing the Products List on Forge-Press Equipment Productivity"]

[Text] One of the basic factors in improving the productivity of forge-press equipment (FPE) is the use of computer numerical control (CNC). Experience in the use of CNC in metalworking equipment shows that CNC is most effective with the use of machining centers in individual and small-series production, i.e., when in the course of a single shift several batches of parts of different type are fabricated. While in the metalworking equipment with NC the primary technological process takes place comparatively slowly and exceeds significantly the time required for adapting the NC to the new control program (CP), in the FPE with CNC the duration of the basic technological process of part fabrication (machine time) in most cases is commensurate with or considerably less than the time required for adapting the CNC to the new CP. Thus, while on the average the machine time for fabricating the part (punching 60 holes with 25.4 mm spacing) on an indexing punch-press of the K0126P type with CNC of the N5502 type is one minute, switching the CNC to the new CP requires about 1.5 minutes (with allowance for reversing the previous tape, checking the new tape and setting the reference point). The operational productivity of the FPP with CNC even with considerable improvement of the equipment will be determined by the time losses associated with switching the CNC to the new CP, and also with the physical capabilities of the operator. To evaluate the dependence of operation of the FPP with CNC on these time losses we study the dependence of the number of parts produced per shift on the press mentioned above, for example, on the increase of the variety of parts being machined. In the development of CNC equipment it is important to strive not only for improved productivity of the equipment itself (reduction of the machine time) but also for the development of a CNC system capable of switching from one CP to another in a time period amounting to no more than a hundredth of the machine time expended in machining the part. CNC systems with the use of microcomputers with adequate volume of the operative memory for storage of the CP, and also CNC equipment which is controlled centrally from a computer having adequate memory volume for storage of the CP, have these capabilities.
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PRODUCTION OF INDEXABLE CERAMIC TOOL INSERTS

Yerevan KOMMUNIST in Russian 23 Aug 83 p 2

[Article by M. Sarkisyan, "'Long-lasting' Cutters"]

[Text] Production of hard-alloy end-milling cutters with mechanical fixing of the disposable inserts, and also with cermet inserts, has started at the Charentsavan Tool Production Association. S. Geodakyan, chief engineer of the association, tells us: "The new milling cutters have several advantages over the previous versions. Not only has it been possible to facilitate the process of installation of the cutters on the machine tools, but their service life has been increased ten-fold." Each year the expanding metalworking industry is presenting the tool makers with new and more demanding requirements. More and more automatic and semiautomatic CNC machines are being put into operation, and they require that the servicing personnel perform rapid replacement of the old, wornout cutter inserts. Previously the machine tool fitter had to remove the cutter from the machine, sharpen it, reinstall it, tighten it down and adjust the machine. It is not difficult to see that the machine had long down times if there were 10-12 inserts on each end-milling cutter. Today the worker only loosens the nut, reverses the insert and tightens it down again. Moreover, the insert was previously pressed into the cutter and had a single cutting face, so that the efficiency of such use of the insert was very low. The fitter had to resharpen the insert from time to time and because of the severe temperature rise the physical and mechanical properties of the cutting metal changed, cracks appeared, and the cutter was soon unusable. Now there is no longer any need for this operation. As a result of the use of all eight faces of the hard-alloy insert it is possible to avoid premature wear of the cutter, and as a result of this it is possible to increase its service life. The new metal-ceramic cutters are finding wide application in the finishing operations, where high cutting speeds are required and, naturally, high temperatures develop.

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LIGHTER, MORE EFFICIENT TUBE-DRAWING MACHINES FROM MINSK

Minsk SOVETSKAYA BELORUSSIYA in Russian 7 Jul 83 p 2

[Article by A. Gladysheva, BELTA correspondent: "The Suppliers Are Supplying Themselves"]

[Text] The output of the Minsk Machine Tool Construction Association imeni S. M. Kirov is expanding without increasing the consumption of rolled metal stock. The first lot of new-generation tube-drawing equipment has come off the production line--equipment with CNC, robot-manipulators and other intelligent and untiring devices. Thanks to the extensive modernization this equipment is 1.6-2 times more productive and at the same time much lighter and more compact than the previous equipment.

L. B. Kolodnyy, deputy chief engineer, says, "The primary source of additional raw material lies right here, in the construction of new-generation machine tools, the large-scale production of which we are initiating. In their development we have used computers more widely than before; the computer calculations were of assistance even in the drafting stage in the removal of excess metal from every one of the components and parts of our equipment, while at the same time improving their efficiency. Replacement of the heavy cast structures with welded structures led to considerable weight savings--ranging from 120 to 150 kilograms of metal per ton. But reduction of the new weight of the machines is not everything. The association is the only source of tube-drawing equipment in the nation and in the CEMA countries, which imposes on us a particular responsibility for improving its quality and reliability. From the very beginning of work on the new family of machines the goal of reducing the metal content of the products was posed not only to the designers but also to all the other departments.

Socialist competition and science are both contributing to the achievement of this goal. Improvement in casting technology alone (together with the specialists of the BSSR Academy of Sciences and the Belorussian Polytechnic Institute) made it possible to reduce by a factor of 4-5 the amount of scrap in the casting of various articles. Considerable metal was saved by eliminating remelting and chip formation as a result of the introduction of cold stamping and other technological innovations. The result was reduction of the load on the existing shops and elimination of the need for

the construction of new shops. Updating of the production equipment also helped to increase the output of the existing shops.

The new, lighter-weight family of tube-drawing machines--in all about 20 models and many modifications thereof--will by next year completely replace on the production line the machines now being produced. By the end of the five-year plan the output of the new machines will increase by nearly 35 percent. The machine tool builders have not ordered any additional rolled metal stock for these purposes from their suppliers.

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BRIEFS

REDESIGNED SHEARS--A significant improvement has been made in the specifications for a new modification of the sheet shearing machine now in series production at the Starokramatorsk Machinery Construction Plant imeni Ordzhonidikze. The Cherepovets Metallurgical Plant has received the powerful new unit, which weighs a hundred tons less than the previous models. The machine, intended for shearing rolled sheet stock, is now equipped with an electronic digital control system. This has made it possible to eliminate several components and mechanisms, which has not only reduced the weight of the huge shears but has also significantly reduced the labor involved in their fabrication. [TASS, Kramatorsk] [Text] [Moscow IZVESTIYA in Russian 13 Sep 83 p 2] 9576

CSO: 1823/37

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TECHNICAL FEATURES OF HOT-STAMPING, LASER MACHINES VIEWED

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 9, Sep 83 pp 29-31

[Article by V.I. Kharkov, engineer: "Automatic Manipulators: Interindustrial Exhibition (cf. MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA, No 6, 1983)"]

[Text] The production system for stamping with an automatic manipulator (AM) is used for fabricating parts made of plastic, as well as in assembly, packaging and machining operations. The system consists of a PRSh-0,2 automatic manipulator, a loading device of the slide type and a press with a force of 63 tons with stamp attachments and a control system. There must not be vapors of acids and alkalis and abrasive dust in the environment.

The operations performed in the system are as follows: taking of the stock by the AM from the loading device; transferring and placing it in the press's stamp; stamping; and removal of the stamped part.

Maximum load-lifting capacity of the AM--0.35 kg; two degrees of mobility; arm turns 90°; arm raises 30 mm; positioning accuracy of $\pm$ 0.1 mm. Time for processing a part--2 to 2.5 s. Overall dimensions--1900 $\times$ 1300 x 2000 mm. Weight--180 kg.

The system was introduced in 1981 at the Leningrad Elektrik Plant imeni N.M. Shvernik.

Advantages--high reliability, precision and high speed, compactness and servicing convenience. With introduction of the system workers are freed from heavy monotonous work.

The annual saving is 4000 rubles.

Developer and manufacturer--VPTIelektro [All-Union Planning and Design Institute of Electrical Equipment Production Technology], Leningrad.

The automated system for die casting with the parting line of the mold in the vertical plane and a cold horizontal pressure chamber is designed for making castings and non-ferrous alloys (aluminum and zinc) in quantity and mass production.

The hydraulic linkage, which creates uniform and reliable locking of the mold, the high molding speed (to 7 m/s), the high compression (to 197 MPa), and the 3-stage molding cycle with independent regulation of the speed at each stage and with multiplication of pressure at the end of molding produce high-quality castings. The weight of the amount of an aluminum alloy which can be cast by means of the casting manipulator is 0.2 (minimum) to 0.6 kg. The weighing error is ± 2 percent. The load-lifting capacity of the manipulator - casting remover is 10 kg. The overall dimensions of the system are 7255 x 2450 x x 2380 mm and its weight is 17,750 kg.

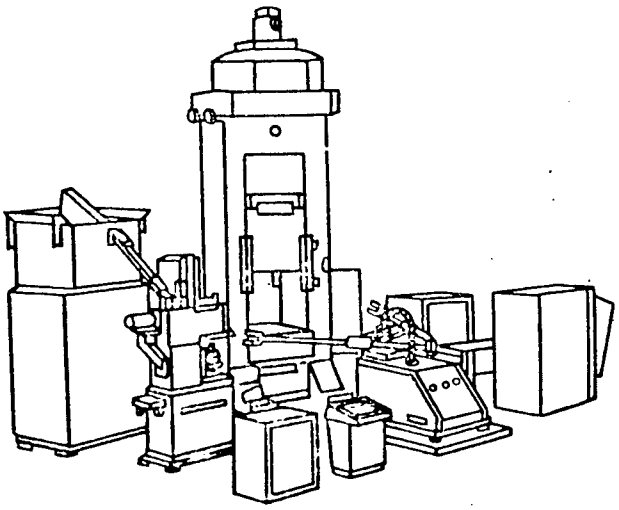

Figure 1. Automated System for Hot Stamping

The AKFB1732A-1 automated system (fig 1) for hot stamping of stock for parts of the bolt, axle, pin, and the like, type consists of a model FB1732A screw press, a KM1 AM, a 25Ts4216 (RPD-1,25 [pressure regulator]), a loading device, a dispensing device, a device for blowing off scale and lubricating the stamp, and a unit for heating the stock.

The following are automatically performed in the system: piece-by-piece feeding of stock from a hopper and aligning it; heating the stock; placing the stock in the press's stamp; stamping the stock; removing forgings from the stamp into a container; blowing off scale, lubricating and cooling the stamp.

The nominal force of the press is 160 tons. The maximum weight of stock is 0.63 kg. Dimensions of the stock are 16 to 30 mm in diameter and 80 to 200 mm in length. Positioning accuracy is ± 0.1 mm. The productivity of the system is 10 parts/min, overall dimensions--4100 x 3700 x 3925 mm, and weight of 15,050 kg.

The annual saving from introducing the system is 63,500 rubles.

The developer and manufacturer of the experimental model is PKTIkuzrobot [Planning and Design and Technological Institute of Forging Robots], Taganrog.

The semiautomatic line is designed for assembling and beading fan housings of the right-hand and left-hand designs. It has a beading and shaping machine and a device with an AM for piece-by-piece feeding of coil stock from an accumulator into a feeding roller conveyer.

The AM operates in the following manner. A carriage on which is installed a crosspiece with pneumatic suction devices moves into the area of the accumulator and the crosspiece is lowered onto the coil stock (steel strips). The compressed-air supply into the ejection devices of the pneumatic suction devices is turned on, and after 2 or 3 seconds, when the top stock under the effect of the vacuum is pulled tightly against the pneumatic suction devices, the mechanism is engaged for feeding the crosspiece and moving the carrige into the area of the feeding roller conveyer. In the area of the roller conveyer the crosspiece with the stock is lowered, the supply of compressed air is turned on, and the stock remains on the rollers of the feeding roller conveyer.

The productivity of the line is 10 housings per hour. The dimensions of the coil stock which can be fed by the AM are thickness of 1.5 mm, width of 300 to 500 mm, and length of 2000 to 3000 mm. The weight of the stock is 20 kg. The number of pieces of coil stock in the accumulator is 50, and the number of pneumatic suction devices is four, and their diameter is 240 mm.

Introduction of the line made it possible to reduce production space 1.5-fold, to reduce labor intensiveness by 25 percent, to improve the quality of products, and to improve working conditions.

The saving from introduction of the line is 40,000 rubles.

The developer is the VPKTIstroydormash [All-Union Planning and Design and Technological Institute of Construction and Road Machines] NPO [Scientific Production Association] and the manufacturer is the Khartsyzsk VPKTI Machine Building Plant.

The line has been introduced at the Ventspils Fan Plant.

The semiautomatic unit with built-in manipulators is designed for assembling and welding fan wheels. Blades are fed piece by piece from a holder by means of a slide device into the manipulator. The manipulator inserts the blade into the wheel to be welded and fixes its position for welding. Wheels are loaded manually.

Wheels are assembled and welded automatically. Welding is performed by means of two semiautomatic welding machines in an environment of carbon dioxide, with wire 1.2 to 1.6 mm in diameter. The productivity of the semiautomatic machine is 25 wheels per hour. The welding rate is 31 to 75 m/h.

Introduction of the semiautomatic machine made it possible to increase labor productivity by a factor of 2.5, to nominally free two workers, and to improve the quality of products and working conditions for workers. The saving from introducing the semiautomatic machine is 20,000 rubles.

The developer is the VPKTIstroydormash NPO, and the manufacturer is the Khartsyzsk Machine Building Plant.

The semiautomatic machine has been introduced at the Ventspils Fan Plant.

The model V-508 semiautomatic line with a built-in twin manipulator for assembling the gearing of clock movements consists of a common base on which are placed an assembly head, a twin mechanical manipulator with five pneumatic gripping devices, a vibrating hopper, a vibrating feeder, and a device for completing wheel units to be assembled.

The upper and lower subassemblies of the clock movement in the assembled state are installed manually at the position of the assembly head. By means of the head's gripping devices each subassembly is fastened, after which the head separates them for the installation of wheel assemblies. The wheel assemblies to be assembled are loaded into vibrating hoppers, where they are aligned. The aligned assemblies are fed to the completion point by means of vibrating feeders.

The completion device removes assemblies from the overall stream and throws them into engagement by groups. The completed wheel groups are gripped by the manipulator, are thrown into engagement with one another, and are installed on the subassembly of the clock movement.

The alignment of wheel journals in the subassembly's holes is accomplished by means of permanent magnets.

Wheel assemblies are installed in the subassembly by means of a mechanical arm. The cycle period is 10 s. The productivity of the unit is 650 pieces per hour. Overall dimensions in mm: of line--800 x 900 x 1800; of manipulator--200 x x 120 x 250. Weight of line--650 kg; of manipulator--0.5 kg.

The STZ-2 equipment vision system is designed for data support for transport and manipulating AM's. It measures the geometrical characteristics of the external environment, information on which is represented in the STZ-2 by a discrete set of distances and individual angles determining the coordinates of individual points of the environment in a spherical coordinate system related to the STZ-2.

The basic element of the STZ-2 (fig 2) is a high-speed laser distance measuring device, 1, which automatically measures distances to surfaces with reflection of a diffuse nature and reflectance at the radiation wavelength of greater than 0.05. The light spike pulses generated by the laser distance measuring device scan the external environment of the STZ-2 in a hemisphere of radius 0.2 to 7 m.

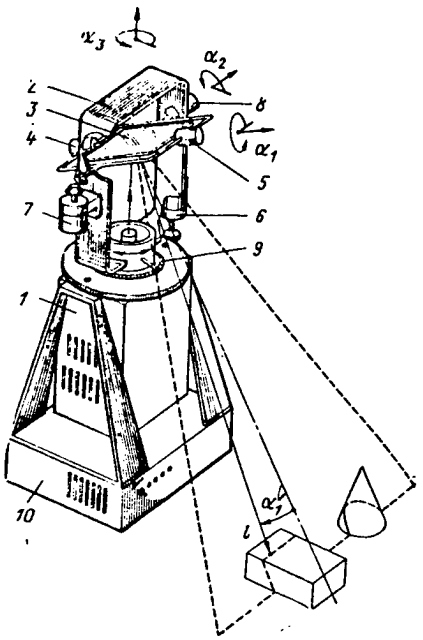

Figure 2. Diagram of STZ-2 Equipment Vision Device

Scanning of the external environment is accomplished by means of a scanning device, 2. Its basic element is a mirror, 3, which is driven into oscillating motion by means of a gear, 4, and which at the same time accomplishes scanning of the medium at angle α_1. The angular position of the beam is determined by means of a discrete measuring element, 5, coupled to the mirror and making it possible to measure an angle with discreteness of 0.5 degrees. The scanning sector can be shifted $\pm$ 90 degrees relative to the angle of sight and $\pm$ 55 degrees relative to the angle of elevation, which are controlled by means of drives 6 and 7. The values of angles α_2 and α_3 are determined by measuring devices 8 and 9.

Organization of combined operation of the laser distance measuring device and the scanning device is accomplished by means of control unit 10, which also makes it possible to change the discreteness of the description of angle α_1 and organizes interaction of the STZ-2 with external devices.

Technical Data

Range of distances which can be measured, m	0.2 to 7
Distance measuring error, m	$\pm$ 0.03
Frequency of:	
Measurement of distance, kHz	2 to 5
Scanning of external environment, Hz	10
Discreteness of scanning of external environment in terms of scanning angle, degrees	0.5

[Continued on following page]

Angular amplitude of scanning, degrees	± 30
Angle, degrees, of:	
Raising and lowering of scanning sector	± 55
Rotation of scanning sector on vertical axis	± 90
Overall dimensions, mm	760 x 330 x x 250
Total weight, kg	10
Supply voltage, V	27 + 3, -5

The semiautomatic unit for assembling spring units of fuse holders consisting of four or five parts operates in a specified "strict" operating cycle or in a free cycle determined by the operator.

The semiautomatic unit consists (fig 3) of unified assembly units: a circular transport module, MRU-901 manipulators, vibrating loading devices, working heads for riveting, and for checking for the presence of parts in satellite devices, and a diagram of assembled units.

The employment of unified units makes it possible to restructure the semiautomatic unit for the assembly of other types of products.

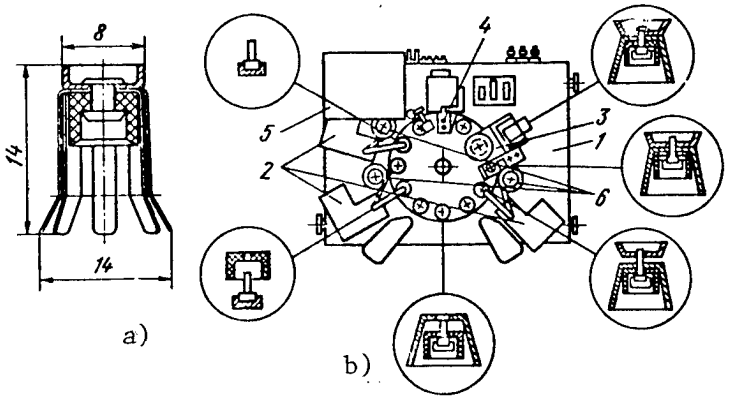

Figure 3. Semiautomatic Unit for Assembling Springs: a--unit to be assembled; b--assembly diagram: 1--MTK-901 circular transport module; 2--MRU-901 manipulators; 3--RGK-901 working head for bonding; 4--unit for removing assembled units; 5--control console; 6--vibrating aligning device

Technical Data of Semiautomatic Unit

Productivity, units/hour	850
Working cycle (controllable), seconds	2.3 to 7
Number of working positions	8

[Continued on following page]

Error in setting satellite devices in working positions, mm	± 0.02
Productivity of loading devices, units per hour	1200
Force of riveting head, N	250 to 5000
Supply from alternating-current line, V	380
Overall dimensions of semiautomatic unit, mm	1050 x 1000 x x 1400
Weight, kg	380

The annual saving from introduction equals 25,000 rubles.

The MOS single-position assembly machine was created for assembling units consisting of two parts by the method of plastic deformation and can be adjusted for assembling an extensive list of units consisting of two to four parts. The installation of working heads for welding, screwing, testing, etc., is possible, as well as use as an automated work place with the basic unit unchanged.

Assembled units are blown into a container by means of compressed air.

The machine is put together from unified standard units, i.e., a single-position module, MRL manipulators, a control system, aligning devices, and a working head for riveting.

Technical Data of Machine

Productivity, units per hour	600
Accuracy of positioning of manipulators, mm	± 0.01
Dimensions of parts which can be fed automatically, mm, not greater than	50 x 20 x 10
Weight of parts, kg	To 0.2
Control system	Cyclic
Supply from alternating-current line, voltage, V	380
Overall dimensions of machine, mm	960 x 790 x x 1420
Weight, kg	180

The annual saving from introduction is 25,000 rubles.

The MRU angular manipulators are designed for loading-and-unloading, transport and assembly operations. They are used for loading and unloading production process equipment (assembly, press, and the like) in combination with aligning devices, as well as in the operations of collecting and combining parts.

The communication unit included in the MRU-901A unit coordinates operation of the equipment and the manipulator, as well as of actuators for feeding stock into the gripping area, checking for the presence of stock and removing parts from the work area.

Technical Data of Automatic Manipulators

	MRU-901	MRU-901A	MRU-902
Load-lifting capacity, kg	0.08	0.08	0.35
Angle of rotation of arm, deg	20-90	20-90	30-90
Vertical stroke of arm, mm	1-10	1-10	5-30
Overhang of arm from axis of rotation (maximum), mm	150	150	300
Positioning accuracy, mm	$\pm$ 0.02	$\pm$ 0.02	$\pm$ 0.02
Cycle period, s	2	2	2
Operating mode	Automatic and setup		
Drive	Electro-mechanical	Electromechanical, reversible	
Number of process commands	4	4	8
Number of information channels	-	5	-
Purpose of information channels	-	Checking for presence of parts in working position and in gripping position, checking operation of production equipment, and the like	
Weight of manipulator, kg	14.5	14.5	38
Weight of communication unit, kg	-	10	-

The annual saving from introduction is 8000 rubles.

Manipulators of the MRL type are designed for performing loading-and-unloading, transport and key production operations, e.g., for loading press equipment, rotary tables of transfer machines and assembly machines, performing assembly, checking, and the like, operations.

These manipulators have a modular design, which makes it possible to choose from possible configurations the most economical, depending on the nature of operations to be performed.

The ESU-901 control system is designed for program control of manipulators having up to five elements with pneumatic drives, as well as for controlling production equipment as part of the system. The control system is used in closed sections.

The system is in the form of a desktop console. For the purpose of communicating with production equipment, in the system are provided two position signal amplifiers (e.g., the signals of a photosensor), and an alternating-current electronic switch which can handle power of up to 300 V•A. Provision is made for the possibility of expanding the functional capabilities of the system by installation in the unit of an additional electronics unit on a single printed circuit board, which can be developed and fabricated for a specific use.

Technical Data of ESU-901

Type of control system	Cyclic
Number of:	
Controllable units of manipulator	To 5
Stop points in controlled unit	2
Production process commands	To 3
Interlocks	To 6
Programmable time delays	3
Program steps	To 26
Program medium	Replaceable diode arrays
Number of control outputs for manipulator unit	2
Supply voltage of manipulator sensors and production equipment, V	15
Control system supply, voltage, V	220
Power requirement, W, not greater than	150
Overall dimensions, mm	360 x 360 x 120
Weight, kg, not greater than	12

The system's design provides for a light display of the state of the manipulator's units and of operation according to the program.

8831
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COMPUTER AIDED DESIGN CAPABILITY AT MINSK PLANT DISCUSSED

Moscow MASHINOSTROITEL' in Russian No 5, May 83 pp 11-12

[Article by engineers Yu. V. Karpilovich and A. I. Storozhilov, under the heading "Production Mechanization and Automation": "Experience in Developing and Introducing the 'Osnastka' SAPR"]

[Text] The swift development of computer equipment had demanded great mobility, the ability to prepare production and master the series release of new computers to replace obsolescent models being withdrawn from production as quickly as possible of the Minsk Computer Equipment Production Association. The efficient provision of production with special technological toolings, along with the use of highly productive, specialized equipment, permits, in addition, the release of output with minimal labor-intensiveness and high quality. The large products list and frequent replacement of output require that the plant design and manufacture a large number of technological toolings, so particular attention is paid to developing tool production.

Tool production is being improved at the enterprise on a base of standardizing toolings and tool designs and introducing leading methods of organizing production. This has provided an opportunity to significantly lower the labor-intensiveness of tooling design by reducing the amount of documentation being processed and using improved design methods, to create conditions most favorable to accelerating preparation of the production of new items and automating the design-technological preparation of tool production.

The first task which was set along this line was to free the designer to the extent possible from performing monotonous, repetitive work, to mechanize and automate his labor based on the achievements of modern science and engineering. In the first stage, design blanks, so-called "mole rats," were developed and used for this purpose, with the constant portion of the design being duplicated onto the blanks by machine.

However, this work method possessed a number of substantial shortcomings, since it involved the necessity of expanding the stock of "mole rats" so as to encompass an ever-greater number of tooling types, as well as with the inclusion in them of a maximum amount of permanent information so as to lower the labor intensiveness of completing them, while at the same time, convenience of use called for a restriction and reduction of the number of such forms.

The use of standard (base) designs was a new stage in the organization of tooling designing, as it created prerequisites for further improvement in and accelerating the preparation of production through the introduction of specialized sectors and work areas, specialized second-order equipment and tooling, group methods of processing and brigade forms of worker labor organization. To do this, we developed registers of standard designs, working drawings of standardized parts and assembly units, and enterprise standards.

All the standardized parts and tooling assembly units, as well as a portion of the standard parts not supplied on a cooperative basis, are currently manufactured in lots in basic production shops and are warehoused for subsequent use when assembling the tooling. Design documentation is not worked out for these parts and assembly units. The drawing nomenclature of the borrowed (including standardized) parts and assembly units are recorded in the specification in accordance with the YeSKD [unified design documentation system], indicating the necessity of procuring drawings of those parts which need not be warehoused in view of their infrequent use, as well as assembly drawings for standard components when not supplied by the designer. As a result, the level of tooling standardization as a whole has been increased to 75 percent, and that of standard tooling -- to 80 percent, while the labor-intensiveness of planning standard tooling has decreased by 30-40 percent.

Automated planning using computer equipment is the highest level of tooling design organization. The enterprise mainly uses the YeS-1022 computer and the "ITEKAN-4" automatic grapher for this purpose. Associates at the Institute of Technical Cybernetics of the BSSR Academy of Sciences participate in developing and introducing the automated tooling design subsystems within an economic-agreement framework. In this regard, in developing and introducing the "Osnastka" SAPR, consideration was given to experience in tooling standardization and typification. It is standardization, that is, limiting design resolution variants and putting them in a form easily processed by computer, which is the very basis of "machine" design.

It should be noted, in evaluating the level of special technological tooling standardization which has been achieved in the branch as a whole, that it could be considerably higher. The current GOST's [all-union state standards] on tooling parts were basically developed as applicable to enterprises of medium and heavy machinebuilding. Therefore, each enterprise is concerned with standardizing tooling for itself, which is an obstacle to standardization in the branch as a whole. Moreover, this situation also makes it harder to develop a unified "Osnastka" SAPR easily adaptable to conditions at any enterprise. As a result, instead of a simple borrowing of finished developments, enterprises are forced, when introducing the "Osnastka" SAPR, to rework the entire complex of automated design programs, and sometimes the algorithms for solving individual tasks as well.

Specialists at each enterprise (often not without foundation) consider their own tooling designs the most successful, technologically effective, reliable and easy to use. This is to be explained by the fact that enterprises (even those in the same branch) use different equipment and technologies, both in basic production and in tool production facilities, by the fact that the level of worker

and engineering-technical personnel skill differs, as do the quality requirements for the items being produced. As a result, different toolings are created at the enterprises for working or manufacturing identical parts (given identical annual output programs).

All these factors were taken into account when developing the "Osnastka" system at our enterprise, which is a base enterprise for introducing it in the branch, with a view towards reducing additional work on it to a minimum when it is introduced at other enterprises. The enterprise is now introducing the following automated tool production preparation subsystems as part of the first "Osnastka" SAPR line:

"Konduktor-3," a subsystem for the automated design of jigs for drilling flat parts;

a subsystem for the automated planning of technological processes for jig manufacturing, to function jointly with the "Konduktor-3" subsystem without additional data input;

a subsystem for the automated planning of parts machining on turret jig-boring presses, intended for the computer generation of design and technological documentation, as well as control programs for working sheet parts on turret jig-boring presses with manual and numerical programmed control;

a subsystem for the automated design of dies for cold-sheet stamping, the "Avtoshtamp-YeS," intended for the computer design of cutting dies and subsequent operation;

a subsystem for the automated calculation of coordinates for maching die parts on jig-boring machines, to be used in concert with the "Avtoshtamp-YeS" complex;

a subsystem for the automated development of control programs for NPC electro-erosion machine tools for machining the working contours of die parts, to be used in concert with the "Avtoshtamp-YeS" subsystem.

All the subsystems operate independently, without comprehensive interfacing to the common SAPR. The program complexes are controlled by a DOS YeS disk operational system. The OS YeS transfers the subsystems to the operational system and improves existing subsystems and develops new ones.

Thus, enterprise specialists developed and introduced the "Ekspress-konduktor" subsystem based on the "Konduktor-3" subsystem; it permits computer jig design without the use of drawings. In this instance, standardized working drawings are used and supplemented by documentation obtained from the computer, that is, there is no longer any need for the automatic grapher-drawer. Manual additional working of the documentation is eliminated, permitting a significant savings in computer time.

The enterprise is developing:

an automated auxiliary tool design subsystem for marking inscriptions on parts, to be called the "Marker";

The technological potential of the subsystem for the automated design of parts machining processes on turret jig-boring presses in order to determine opportunities for working large openings in parts and calculating the amounts of involution for curved parts being manufactured on NPC presses;

an automated design subsystem for stationary jigs for drilling angle, channel and other types of parts;

a subsystem for the automated design of "Avtoshtamp-YeS-1" punch dies.

The time spent on planning tool preparation for production has been reduced by 30-40 percent as a result of the use of these SAPR's being developed. The overall hypothetical annual economic impact from introducing the subsystems of just the first line of the "Osnastka" SAPR at the enterprise has been more than 80 thousand rubles.

11052
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STATUS OF MODERNIZATION DRIVE IN MACHINE TOOL INDUSTRY VIEWED

Moscow PRAVDA in Russian 12 Dec 83 p 2

[Article by M. Vasin: "Numbers in Overalls"]

[Text] It would seem that only streams of raw and other materials are converted into parts and finished products. Actually, each plant is also a large production facility for converting energy and information. Both are required component parts of the manufactured product. That is the way it always was. Only before the second component was not given very much importance. The third component, the informational production cycle, in general flowed somehow unnoticed and was concluded by the preparation of what is called with little respect -- pieces of paper.

But times change. Energy declares more and more loudly its role in industrial production. As far as information is concerned, there is so much of it in modern enterprises that it is very difficult to say what is more necessary to be "shoveled" at the plant -- material tons or weightless information and numbers.

This "production" on reprocessing data, which existed latently, began to come into the open recently when it was discovered that many factories, plants and associations, working in the old way, could not dig out of the difficulties and problems related to the rapid scientific technological progress, the necessity of assimilating previously unfamiliar raw materials and produce new products, and therefore, introduce considerable changes into the habitual smooth technology. At the same time, experience with operating equipment with programed control, machine tools, presses and robots, convinced one that the programed control can be effectively rearranged for manufacturing new products. What is the main distinction of such machine tools, presses and robots? It is that their actions are controlled by numerical control devices (ChPU) using many varieties of computers that calculate with enormous speed semiabstract numbers designated by units and zeroes, since they use a binary number system rather than our decimal system.

The ability to count units and zeroes will apply also to transport-warehousing complexes, systems of operational planning and control of production, as well as new automated design systems. By combining all of these calculating-

solving capacities into one whole, specialists obtained from the present clumsy and, at times, skidding shops and sections a new phenomenon in industry -- a GAP, i.e., flexible automated production facilities. They use considerably fewer workers, increase productivity sharply, are changed over rapidly from manufacturing one product to manufacturing another one and, at the same time, take into account disturbances in the technological process caused by changing the raw materials, interruptions in the delivery of semifinished products, insufficient cadres, illnesses and vacations of personnel.

What the possibilities of the GAP would be can be imagined if they were arranged not from "handy means," as at present, but from specially developed models for them of machine tools, robots and control systems. These would have been shops and sections that produce a very great variety of products practically without participation of man at a high rate.

But flexible complexes, created anew, are too expensive. Therefore, at present, specialists orient themselves basically, where this is expedient, on forming automated production facilities on the basis of the equipment available in the shops. Fortunately, the field of activity is very wide: our industry has 100,000 machine tools with ChPU, thousands of robots, while their loading, if they operate individually, does not come up to even half of the rated one. If they were included in "brigades" of automatic machines, their utilization coefficient would increase to 80 percent of the daily time.

These and other GAP advantages led to the idea of their creation and introduction and very rapidly won many supporters. Only three years ago, the first such production facility was placed in operation at the Dnepropetrovsk Electric Locomotive Building Plant, while today they are designed and placed in operation by the dozens -- in Moscow, Leningrad, Novosibirsk, Vil'nyus, Ryazan', etc.

The attractiveness of flexible technological systems is so great that they dream about them where there is no suitable material-equipment base for them and where there is no automation experience of a high standard in general. How to come out of this situation at such enterprises, if "flexibility" is actually needed there?

Many see a way out in creating not an entire flexible production facility, but its primary cells -- modules: one-two machine tools, plus a robot, plus a transport and a control system. Dozens of such modules are being designed at present. Depending upon specific conditions and problems, they will operate either individually or in combination with other modules or, finally, in traditional, rigidly automatic lines.

A very interesting approach. Only it is not quite clear how cost and accounting economics will apply to the modules. We spoke about that with professor M. B. Ignat'yev, manager of the computer department of the Leningrad Aviation Instrument Making Institute. He is a prominent specialist in the area of creating GAP and manager of the purposeful comprehensive program on flexible automated production facilities of the RSFSR Minvuz [Ministry of Education] .

"Domestic scientists and engineers achieved considerable successes in the 'ability to count,' when it is necessary to solve important practical problems. Equipment for solving various problems was created and methods for its efficient application were developed," stated Mikhail Borisovich. "From actual operating conditions, our specialists learned to 'compute' the design of robots and technological equipment, and the architecture of the control systems for them and the entire production process. The development of the means of the automatic design progressed far. Various flexible modules are designed and created, a number of prototypes are tested and are being prepared for production. It may be confirmed that the technical side of this matter is basically solved. Now the time has come to carry out other thorough calculations -- take into account the costs of this or another flexible system and the economic and social advantages of its adoption. We are speaking primarily about modules. There is no experience in utilizing them. Therefore, it can only be assumed that in an especially favorable production situation they, in spite of the very high cost, will be economically advantageous. In other cases, however, it will be difficult for enterprises to repay the expenditures for the flexible modules. An analysis of the operation of near in purpose equipment systems -- robotized complexes and sections, leads to this conclusion."

"Let us take a fairly widely distributed technology -- punching parts. At many enterprises, it is done by programmed automatic equipment serviced by robots. To find the automatic machines in operation is not so simple: at some plants they are more idle than in operation. Did the equipment not suit the plant? On the contracy, the equipment is excellent which is why it stands idle -- in a few days it does a month's program and there is nothing more for it to do."

A comparison method is, of course, not always accurate and professor M. B. Ignat'yev, spoke of a development which is related directly.

Printed circuits are the basic "stuffing" of computers, programed control devices, TVs, radio receivers, etc. They are plates on which complicated electroconducting patterns are applied and in which many holes are drilled for wiring circuit components.

Printed circuits are made in thousands of enterprises. Their production requires fairly high manual labor. The desire to automate it is understandable. But how to implement this desire if such sections are very small, sometimes occupying only two-three rooms, if automation requires a change in the technology and the creation of new "flexible" equipment? The matter lies not in scientific technological possibilities. They are available. The problem is in economics: the innovation will have the same fate that befell the share of some robotized complexes on stamping -- being idle because it is perfect. Only expenditures will be considerably higher.

Does this mean that "flexibility" of this kind of sections is a thing of a very remote future?

"Precisely so," thinks professor M. B. Ignat'yev, "If the course is held on the creation of expensive complexes for one enterprise. As a rule, it cannot afford it. But there is another way. For a number of years, a course has been underway in the Soviet industry on specialization and cooperation. The correctness of this course is again confirmed, and very convincingly, by the requirements of scientific technological progress: only based on specialization and cooperation is it possible to create perfect readjustable complexes whose operation will be economically advantageous."

If one stands precisely on this ground, the idea of flexible modules and, particularly, automation of printed circuit production, becomes immediately realistic and nonruinous. Such a development, which is the last word in science and technology, is already planned by the specialists of LEMZ -- Leningrad Electromechanical Plant, the Aviation Instrument Making Institute, the LGU [Leningrad State Institute imeni A. A. Zhdanov]and the Electrowelding Institute imeni Y. E. Paton of the UkSSR Academy of Sciences. The planned production facility will produce so many products which will exceed greatly the LEMZ requirements and by fulfilling orders for printed circuits from many enterprises of the Leningrad region, will insure the profitability of this innovation.

The concept of such interindustrial flexible automated technological centers is, as is said, in the air. No wonder this thought is expressed independently of each other by many specialists living in various corners of the country. And in some places, its realization is being started. For example, in the Leningrad Machine Tool Building Association imeni Ya. M. Sverdlov a flexible complex for housing parts is being created. To load its capacities fully, several interested enterprises will cooperate in its creation. In connection with the plan for forming in the Minstankoprom [Ministry of Machine Tool and Tool Industry] system a number of flexible automated production facilities a question is being discussed of creating on this basis interindustrial technological centers: on producing gear wheels at Pskov, reducers at Maykop and hydraulic apparatus at Lyudinov.

Calculations and investigations made by the Russian Federation vuz scientists within the GAP program in the republic, indicate that there are about ten mass production technologies that can be automated using the newest processes for treating materials and computers. This is, in particular, design and manufacturing dies, castings and fastenings; products based on special welding and powder metallurgy methods.

Due to the high productivity and flexibility of each such facility, it will be possible to provide its product to enterprises of entire industrial regions such as, for example, the Moscow, Leningrad, the Urals, Volga, Siberia and the Far East. It should be stressed that we are talking about the creation of precisely regional, interindustrial technological centers. This will provide the possibility of preventing counterflows of raw materials, products and information and, consequently, will reduce expenses and raise profitability.

Ancient "philosphers with a mathematical inclination attempted to prove that numbers control the world." The present development of science and industry reached the stage that, based on facts, it may be asserted without exaggeration that numbers control production. Here we should remember that they now do not shun the smock of a designer nor the overalls of a highly skilled machine tool operator, or even of an auxiliary worker. This means that unprecedented possibilities have opened up for the automation of enterprises and the elimination of manual labor. Flexible technological centers are a powerful means for accelerating scientific technological progress.

2291
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AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

KIEV INSTITUTES, PLANTS DEVELOP COMPONENTS FOR FMS

Kiev PRAVDA UKRAINY in Russian 10 Nov 83 p 2

[Article by A. Sokol: "Institute and Plant"]

> [Text] GAP is flexible automated production. It can do without a human. So far, they can be counted in units in the world; according to specialists there are 130 of them. The June (1983) Plenum of the CPSU Central Committee directed that such production facilities should be created and introduced more rapidly. We are talking about automated plants. They may be shops, sections. Within them -- machine tools, processing centers, computers, robots. Devices are also needed which have "sensing organs." Collectives of scientists and specialists of the Kiev Polytechnical Institute and enterprises of the capital of Ukraine are working on such devices.

Several years ago, six educational-scientific-production associations were formed on the basis of the institute and Kiev Plants. Acting on social principles, this made it possible to raise the preparation standard of specialists, activate the scientific work of instructors and students and introduce scientific developments faster into practice. At the "Arsenal" Plant imeni V. I. Lenin the vuz opened a branch of the Instrument Making Department. The Arsenal people organized a laboratory. A collective was born in which a scientist instructor, a production manager, a graduate student, an engineer and student not only study but also work side-by-side.

"Cooperation with the 'Arsenal' Plant, the Kiev Radio Plant assocations and others makes it possible to solve problems of scientific technological progress," stated professor V. Ostaf'yev, doctor of technical sciences and manager of the Instrument Making Technology Department of the KPI [Kiev Polytechnical Institute imeni 50-letiya Velikoy Oktyabr'skoy Sotsialisticheskoy Revolyutsiya]." In this five-year plan period, we developed several dozens of devices. In the process of working on them, we received 50 author's certificates. In recent years, we have participated actively in the creation of flexible automated technologies. We have already made many interesting devices for them.

V. A. Ostaf'yev's area of activity is control and diagnostics of machining in the GAP. He describes this work vividly and the unusual qualities with which machine tools and lines are endowed such as, the ability to "hear," "see," and correspondingly "think" and act.

For what reason is a device that can, say, "hear" needed?

As is well known, a machine tool is equipped with a cutter; a processing center has up to 200 tools and a line has several times more. Each one of them, even of the same type, has its service life. Highly skilled workers, masters-"nuggets," can tell by ear when a tool needs to be changed. But there are not enough "nuggets." A modern monitoring device is needed, KPI specialists and their colleagues together with production workers found such a device.

The invented device is capable of detecting the entire spectrum of vibrations of the working tool. The spectrum changes with the degree of wear. The miracle monitor can operate in the flexible automated system independently. Its various modifications are already operating in enterprises in Kiev, Dnepropetrovsk and Taganrog. It saves over 90,000 rubles annually at each enterprise.

However, the device recognizes only a blunted or broken tool. Eyes are needed for finer operations. These eyes must have unusual, fantastic sight. In manufacturing especially precise products, it is constantly necessary to regulate the cutter as it wears, moving it to the part by a distance equal to the value of the wear. The vuz scientists and the production people created a new in principle optical-electronic device for this. Using a laser beam, it observes microscopic changes in the tool's shape and corrects the tool's position correspondingly. The applications of seeing devices are many. For example, they certify the high precision parts of radio apparatus, guaranteeing their reliability and eliminating manual labor.

But even the miraculous devices have to be "tied" to a computer. The latter needs a program. A very difficult problem is to make the machine "think" of the obtained data and adopt the most rational decision. To solve this problem, the vuz scientists relied on manysided cooperation. A number of original algorithms and programs that make it possible for the computer to develop metalworking technologies have already been created.

Man, determining technology, is guided by knowledge, experience and intuition. He is in no condition to sort out all possible versions. The algorithms and programs developed by the Kiev people made it possible to automate the search of optimal versions for machining parts with a large number of various holes, select the most efficient cutter and its trajectory, the best speed of cutting, etc. As a result, productivity of labor increased by 25 to 40 percent.

Automation of production gathers greater and greater speed. Over 300 industrial robots are in operation in Kiev. The "Kommunar" Association, having created a section of robots, took a step in the "unmanned" technology. Many problems

are solved by production people together with scientists. Specialists of the Polytechnical Institute perform tasks for almost ten enterprises. These specialists are: professor V. Ostaf'yev, assistant professors P. Usachev and V. Rumbeshta, senior staff member G. Tymehik, graduate students V. Shevehenko and K. Makhmudov, students Ye. Polunin, A. Bykov and G. Komenda, deputy general director of the Kiev Radio Plant Association, A. Kachura, technologist of the "Arsenal" Plant Association V. Mel'nichenko, shop chief of "Arsenal" V. Lezhnev and engineer of the Aviation Plant A. Globa. The list is a long one. Developments by this group which were introduced in enterprises of the republic save over 15 million rubles annually.

2291
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PLANS FOR FMS, CAD/CAM IN LENINGRAD PLANTS DISCUSSED

Leningrad LENINGRADSKAYA PRAVDA in Russian 25 Sep 83 p 2

[Article: "Scientific and Technical Progress Is the Way"]

[Text] The decisions of the 26th CPSU Congress and the resolution of the party Central Committee and the USSR Council of Ministers, "Measures for Accelerating Scientific and Technical Progress in the National Economy" singled out the tasks of automating scientific research, design and technological work and creating flexible automated procedures based on extensive use of computers as one of the basic directions.

In many branches of industry in the city of Leningrad, development of integrated production complexes, the main feature of which is the complete automation of the "design--production" process by means of electronic computers, is currently underway. In recent years automated management systems for some procedures and samples of automated technological equipment--machine tools, robots, and automated transport--have been created. Since the beginning of the current five-year plan period more than 70 automated sections and lines have been equipped and about 900 robots and autooperators and more than 1,000 digital control machine-tools have been introduced.

On the eve of Machine Builders' Day a conference was held in the Smolny Palace at which ways to further develop complete production automation were determined.

Directors of some enterprises, scientific-research and planning-design organizations, institutions of the USSR Academy of Sciences, and higher educational institutions and responsible workers of Leningrad oblast and city party committees participated in the conference.

It was stated at the conference that one of the important tasks is the transition from separate automation systems to integrated production complexes and flexible automated production. The introduction of these systems significantly speeds up the growth rates of labor productivity, increases production effectiveness, improves production quality, reduces the proportion of manual labor, and releases production areas. It is thus important to enhance the level of organization and discipline. The new type of automation is valuable first of all because it allows automation of single-unit and small-series manufacture which is the main part of the machine and instrument building industry in Leningrad.

It was emphasized in the speeches that in the creation of integrated production complexes and flexible automated production the methods of group technology in production organizations are very important. It was also pointed out that it is necessary in the very near future to carry out the classification and grouping of parts of all city industrial enterprises in order to excelerate the introduction of group technology.

One of the main tools which allow realization in practice of the goals of complete automation of the "design--production" process are the information computer cells. Leningrad has gained experience in using collective use computer centers and multiprocessor information control systems. At present, at the Lengingrad Scientific-Research Computer Center of the USSR Academy of Sciences work is actively underway to create a regional computer net.

Great attention was concentrated on the goals of co-ordinating the efforts of enterprises and organizations in the creation, also using co-operation, of the software and hardware for integrated production complexes, in the manufacture of automated equipment storages, robots, transport and control-and-measuring means. Also problems were discussed connected with broadening the education of specialists for this purpose in the higher educational institutions, technical and production-technical schools of the city of Leningrad.

City and rayon party committees have the goal of taking over strict control of all the work of creating integrated production complexes and flexible automated production and the effective loading of the electronic computers in order to automate scientific researches, design and technological works, of the creation of flexible automated production. All this activity has to be performed in order to carry out plans and socialist pledges in Leningrad city and oblast. All these questions are to be taken into account in the technical progress plans for the current five-year plan period and the future prospects of the enterprises in all branches of industry, construction and transport. It is considered that councils of the economic and socialist development in the city and district committees of the Communist Party of the Soviet Union should play a great role.

Director of the Leningrad Scientific Research Computer Center of the USSR Academy of Sciences, V. M. Ponomarev, Director of the All-Union Scientific Research Institute "Elektrostandart" V. M. Val'kov, department chief of the All-Union Scientific Research Institute of Radio Apparatus L. V. Orlovsky, Rector of the Ship-Building Institute D. M. Rostovtsev, Director of the Institute of Social Economic Problems in the USSR Academy of Sciences I. I. Sigov, and others addressed the conference.

The speaker at the conference was First Secretary of the Leningrad Oblast Party Committee L. N. Zaykov.

12563
CSO: 1823/40

BETTER MANAGEMENT, PRODUCTION OF CAM SYSTEMS DISCUSSED

Moscow EKONOMICHESKAYA GAZETA in Russian No 40, Oct 83 p 6

[Article by A. Dukhanin, deputy chief of the Automation Department, Rezinoproyekt State Planning Institute, Moscow: "Automated Control Systems: How to Improve Their Effectiveness"]

[Text] The CPSU Central Committee and the USSR Council of Ministers, determined in their resolution "Measures for Accelerating Scientific and Technical Progress in the National Economy" that extensive automation of technological processes is one of the main directions in the work. Taking this into consideration, the creation of the automated control systems (ASU) acquires special significance. However, it is not a secret that sometimes the automated control systems are not effective. Why?

In our opinion, the reason is the imperfect organization of the operations for the creation of automated control systems. For example, at present we are failing to coordinate, at all stages, the plans for developing and introducing automated control systems with the date of the construction and putting the enterprises into operation.

I think the effectiveness of capital investments in the creation of automated control systems will improve if the following sequence is established.

The target for enterprise planning is worked out by the customer of the project in cooperation with the general planner on the basis of calculations carried out for the given project within the scheme of the development of the appropriate sector. This should occur after the entire complex of operations for technical and economic basing (TEO) of the automated control systems is completed and the specialized organization, the designer of the automated control system, is determined.

The technical target (TZ) as well as the technical and economic basing are the required initial documents for carrying out operations at the technical and working design stage. Thus, the schedule of operations should be coordinated with all interested organizations and linked to schedules of construction and putting of the enterprises into operation in conformity with the capital construction plans. The customer provides the general design organization with approved design target and other appropriate documents along with technical

and economical basing and technical target for the automated control system design.

In order to ensure that the construction work is carried out ahead of other operations, the performers of the automated control systems provide the general design organization, on the basis of the results of draft work-ups at the technical target stage, with materials in the volume of the section "Automation of Technological Processes and Enterprise Management."

In order to create conditions under which such a schedule will begin "working," it is necessary to add to the "General Sector Management Methodical Materials" (ORMM) that the customer and the working out organization are responsible for the system introduction.

The design organization incentive fund should be created only in accordance with the studies introduced on the basis of actual economic effectiveness determined at the test operation stage before putting the system into industrial operation.

12563
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EXTENSIVE USE OF INDUSTRIAL ROBOTS ENVISAGED

Tallinn SOVETSKAYA ESTONIYA in Russian 2 Sep 83 p 3

[Novosti article by S. Abramov, candidate of economic sciences: "Robotics Gathers Pace"]

[Text] Anyone who has recently acquired one of the popular "Raketa" wristwatches produced at the Petrodvorets watch Plant near Leningrad probably did not suspect that their mechanisms were put together by the steel clutching devices of automatic manipulators. In the assembly shop at this plant 63 automated lines have been set up; they are equipped with 150 robots that assemble 4 million watch mechanisms each year in accordance with a specific program.

Assembly is done in a strict sequence and with an accurately speficied rhythm. First the steel arm of the manipulator takes a component from the transport cassette and places it in a particular place inside the watch. Moving along the transporter, the cassette enters the operating zone of another robot, which also takes from it the component it needs. The cassettes, as it were, supply the robot assemblers with the necessary parts and entire assemblies. After several dozen movements another "Raketa" watch "comes to life" and starts to count off the seconds.

The plant has become a special kind of school for the robotization of production. More than 60 enterprises in the radiotechnical, electronics, instrument making, electrotechnical and other sectors of industry have now familiarized themselves with its experience.

Initial work on the problems of developing and introducing automated manipulators was done as long ago as the late Forties. However, the technical imperfection and poor economic effect of the first robots became an insurmountable barrier on the road to their extensive introduction into production. The modern technical basis of robot manufacture was laid here in this country during the 10th Five-Year Plan. During that period more than 200 models and modifications of industrial robots were developed and fabricated, and of these about 40 are now in series production. More than 7,000 manipulators are now being produced, and as a result 20,000 people have been released from heavy physical or dangerous work and a considerable savings has been achieved.

Robots have been used in heating furnaces and stamping presses, horizontal forging machines, plating baths, numerically controlled machine tools and semiautomatic devices. They are used to apply ceramic coatings to smelted articles, paint components and grease billets in conveyer belts. They are used in the fabrication of printed circuits and integrated circuit boards and picture tubes. Robots are also used for loading and unloading conveyer belts and automated lines, arranging components and semifinished products in multiple packaging, and other intrashop transportation and loading and unloading operations.

In accordance with the tasks of the 11th Five-Year Plan goal-oriented comprehensive scientific and technical programs have been drawn up for robotics work under the USSR State Committee for Science and Technology, the USSR Academy of Sciences and the industrial ministries and administrations, and are being successfully implemented.

Realization of the program to develop and master automatic manipulators will make it possible during the period 1981-1985 alone to develop and produce about 50 models of new industrial robots and 38 technological complexes of the "machine-robot" type, and to standardize 49 subassemblies of articles, including program-controlled devices, electric drives, hydraulic-pneumatic equipment and data sensors.

Almost 200 tasks in the program have been set for machine building, the coal industry, ferrous and nonferrous metallurgy, agriculture, light industry, the food industry and transportation.

Machine building will be the main object for the introduction of robots. Manipulators with program control will completely handle metal-cutting, forging-and-pressing and casting equipment, and their functions will be extended in welding, assembly and painting operations. "Machine-robot" technological sets are being developed for mechanical handling, cold and hot pressing, high-pressure casting and the assembly and painting of parts.

Realization of the tasks set for the period 1981-1985 will make it possible to enlarge the inventory of automatic manipulators by a factor of six compared with the 10th Five-Year Plan. At least 40,000 robots will be introduced in industry. As a result, another 70,000 people will be released from heavy manual and monotonous operations. During the period 1986-1990 the scale of this work will be significantly expanded. Savings will also increase.

Major steps to develop robotics are also envisaged in the programs of the industrial ministries, in particular, in a goal-oriented, comprehensive scientific and technical program to develop and introduce robots, manipulators and robotics complexes during the period 1982-1986 adopted in the USSR Ministry of Instrument Making, Automation Equipment and Control Systems. In the words of the minister M.S. Shkabardnya, the adoption of this program is explained by the fact that "the time has now come for the mass introduction of robots in industry. About 2,000 manipulators are now in operation in the sector, and there will be 30,000 in 1986."

These 30,000 industrial robots will occupy 45,000 working places. Comprehensive mechanization and automation of production processes with the aid of individual robots and robotics complexes will make it possible to lower the level of manual labor in the sector to 28 percent.

With costs of $250 million to implement the sector program, the annual savings will amount to $135 million. But the social effect will be even greater: monotonous, heavy physical labor will be made easier and even eliminated.

At many enterprises in the country testing-and-demonstration sections and shops completely equipped with robots have already been set up. Thus, in one section at the "Prompribor" association in Orel, 33 robots are engaged in the fabrication of heat regulators for domestic refrigerators. Whereas before a total of 720 people used to work here to produce 2 million instruments annually, now 350 produce 7 million of the instruments. And although the section was set up only in 1981, all costs have already been fully recouped.

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NEW INDUSTRIAL ROBOT IN TESTING SPACE AT TEKHNOPRIBOR INSTITUTE, SMOLENSK

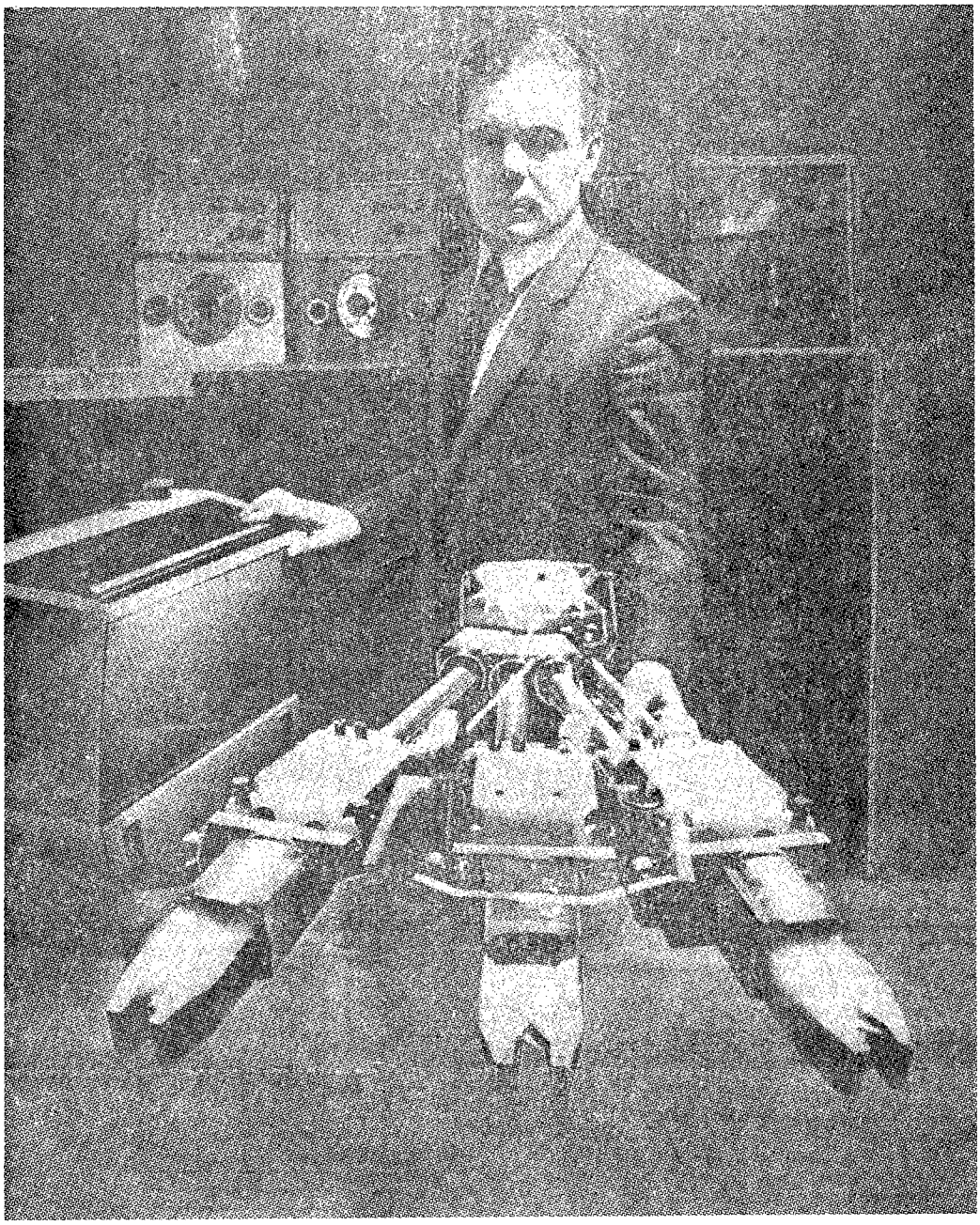
Moscow PRAVDA in Russian 20 Jan 84 p 1

[Caption: "Tests Are Under Way"]

[Text] One of the directions of the work of the scientists and engineers at the "Teknobribor" Institute, Smolensk, is toward development of industrial robots. Already five models of such robots are in series production. Currently, tests are in progress here on a new prototype of an industrial robot, the TsPR-1P, which can be quickly reprogrammed and replace two robots at once. Such a machine frees people from monotonous work. The new robot was developed by a group of engineers under the direction of the project's chief designer, V. Troshchenkov.

[In the picture: Testing of the new robot is directed by M. Borovskiy, head of the department of robot implementation.]

[Picture on following page]



CSO: 1823/107

ROBOT WITH 'VISION,' 'TACTILITY' DEVELOPED AT ROSTOV

Moscow GUDOK in Russian 10 Dec 83 p 4

[Article by V. Bondarenko, TASS correspondent: "Robot is Learning to Think"]

[Text] The robot created by the Scientific Research Neurocybernetic Institute of the Rostov University can orient itself rapidly and without error to its surrounding medium.

Not entirely resembling a man externally, this electronic person weighing one-and-a-half tons demonstrates willingly remarkable abilities. It "sees" and "feels" objects standing before it uncommonly sharply and precisely. Here it took hold of the viewing hood of the TV picture tube, and tested with its mechanical arm that it not slip out, then carried it in the indicated direction. With equal skill, its amazing arm takes a thinnest spring and a heavy shaft, while its "eyes" distinguish the needed part among ten others.

A model of a purposeful, selective perceptive robot was developed by psychologists and neurophysiologists. The eye of the robot is a complicated optical-cybernetic system which casts a glance at a needed part, noting only two-three of the most important criteria, say, color and size. Additional information is given by a table to which a special sensor is attached, with the selected object lying on the table.

However, to see is still not to act. The Rostov specialists developed a system for forming knowledge in the robot, which determines what the robot should do with the detected object. All information enters the system for controlling the arm which is equipped with sensitive force-torque sensors. With them the arm can determine precisely where a counterforce comes from and can adopt a corresponding decision: for example, take the object with its grip tightly or carefully. The system's possibilities were checked thoroughly on an "Eye-arm" on a test bench and this work received a gold medal at the USSR VDNKh this year.

Blinking with screens and monitoring lamps, the robot immediately inserted a core into a sliding hole, sorted out parts mixed in a pile and distinguished

a cylinder from a cone... All this was demonstrated to us today in only several minutes of our conversation. In time, robots will convert from loaders and servers into wide "specialists" capable of doing many operations on the assembly conveyor, at mine stopes, in the most precise and complicated production facilities with constantly changing working conditions.

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