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USSR Report

CONSTRUCTION AND EQUIPMENT

(FOUO 3/80)

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METALWORKING EQUIPMENT

SOVIET FOUNDRY INDUSTRY'S FUTURE PROGRESS DETAILED

Mechanization, Automation

Moscow LITEYNOYE PROIZVODSTVO in Russian No 1, Jan 80 pp 29-31

[Article by I. A. Onufriyev, engineer]

[Text] Casting is still the main base for production of blanks for metal components in machine building and a number of other sectors of the national economy. A forecast of the development of structural components of machines and machine tools shows that the percentage of castings in machinery production will not drop appreciably up to the year 2000. The outlook for mechanization and automation of the foundry industry is delineated by the following major areas, which have evolved to a great extent with the participation of this journal.

Production of Molds. This is one of the major areas of casting production, involving about 25% of all foundry workers. During the ninth and tenth five-year plans, the casting machinery industry of our nation all but completed the development and introduction of automatic casting lines for sectors with large-series and mass production, as well as for those with diversified series production. Lines of standard sizes have been developed for molding flasks with dimensions of 400 x 500, 700 x 800, 1100 x 750 and 900 x 600 mm (models 22821, 265SM, 22823, K-160, KV-301, 1012, etc). On the basis of the perfected designs, a family of lines is being developed for all forms of casting with provisions for installation in existing shops. A second generation of automatic lines is going into production.

The All-Union Scientific Research Institute of Foundry Machinery and Technology has developed a new casting line with a considerable reserve capacity suitable for making parts of any complexity, with automatic exchange of fixtures (patterns) during the casting cycle, so that individual castings can be made, and at the same time two sets of patterns can be molded. The line has electronic control with a program for mold packing and for the order of exchange of patterns, with future conversion to an automated system for control of technological processes.

In addition to developing original designs, the casting machinery industry is making extensive use of foreign experience. For example the Siberian Scientific Research Institute of Foundry Machinery has reproduced the KW-301 line on franchise with the Künkel Wagner Company of West Germany with casting flasks measuring 1100 x 750 and 1000 x 1500 mm.

A new generation of automatic lines has also been developed for molding without casting flasks. Lines with horizontal assembly (KL2002, 22714) are being series produced with mold sizes of 600 x 450 and 800 x 600 [mm], and four new lines are now under development (with pairwise horizontal assembly) for mold sizes of 1000 x 800, 800 x 600 and 600 x 500 mm, and with vertical line assembly with hourly capacity of 400 molds.

A new automatic stacked-mold casting line model 1012 for mass production of small castings is being made with hourly capacity of 500 molds. Ten lines (models LN218, LN212, LN141 and LN240) have been developed for medium-sized and large castings with flask lengths from 1200 to 3000 mm. Plans are being made to convert medium casting shops completely to automatic lines. Work is also being done on development of modern individual molding machines for small casting (four paired patterns). Series production of the new casting machines is supposed to be organized in 1980.

The development of molding equipment is taking the direction of creation of qualitatively new complex automatic casting lines with automated systems for control of technological processes for medium and large casting with combined methods of mold packing, and development of lines for molding without flasks for series and mass production in intermediate and small-scale casting, including with the use of various chemical self-hardening mixtures that give precision castings with weight reduction by 20-25% and shorten the production cycle by a factor of 2-3. The goal of these developments is to organize automated specialized shops for production of precision castings.

New technological processes and equipment are being developed for mold preparation. 1. In sand-slinger molding, good packing is attained for complicated ribbed castings and noise is reduced by a factor of 2-3 as compared with packing by jolt-ramming. Under development are: sand slingers with capacity of more than 100 m^3; wide-cut slingers as a basis for automatic lines of all types; sand slingers for application of lining layers; work is being done on mechanizing the application of lining compositions for large-scale casting. 2. Combined packing of molds by jolt-ramming, vibration and pressing reduces noise by 50% and increases productivity by 50%; high density is attained. Molding aggregates are being developed with vibropress packing, with and without spring systems; improved molding aggregates with simultaneous jolt-ramming and pressing; high-capacity automatic lines with sandblast method of mold packing. 3. When casting is done in metal-lined molds, a small amount (10%) of molding mixture is used, thin castings are made, and the rate of hardening of the castings is regulated. Universal molds and machines are being

developed for small-series castings; machines for making lined molds from conventional molding mixtures; aggregates and machines for making large castings (10-20 metric tons) in lined molds. 4. The use of chemical self-hardening mixtures shortens hardening time, as well as increasing precision and labor productivity. Machines and lines are being developed for making intermediate and large-scale casting molds from chemical self-hardening mixtures: molding mixture vibropackers, other kinds of packers, lines and the entire equipment complex; machines for new processes, and combinations among them. 5. The use of shell molds improves the productivity of mold preparation and the accuracy of castings, as well as reducing the consumption of molding mixtures. Machines and lines are being developed for small-series casting production, and also machines and lines with combined features (shell molds). 6. Molding without casting flasks to make wet molds increases productivity by a factor of 2-3 as well as improving casting precision and reducing the cost of equipment and castings. Second-generation machines and lines are being developed with horizontal mold stacking, mechanized core placement and automation of teeming; high-capacity machines and lines for paired molding without casting flasks in sizes up to 1000 mm with mechanized placement of cores and teeming; lines for paired and stacked molding without casting flasks with a capacity of 150-450 molds per hour; automatic lines combined with core machines that deliver the cores to the line. 7. For making large molds (>1000 mm) without casting flasks based on chemically hardening mixtures, machines and lines are being developed for making intermediate and large molds from ZhSS and KhTS mixtures, and also a set of equipment for sections where individual and small-series flaskless molds are made.

Production of Cores. Core production involves 15-18% of the total labor inputs in making castings. About 14% of all foundry workers are employed in core departments, about half of them unaided by mechanization, and therefore exceptional significance attaches to the development of new machines and automatic lines for making cores. Production has been mastered on 15 standard sizes of automated core lines for making cores weighing up to 600 kg, as well as 10 standard sizes of core machines with core hardening in heated fixtures. At Pavlodar Transport Plant, a specialized shop has been set up for making cores, that is equipped with four core lines with capacity of 50-60 cores per hour (core weight 40-100 kg). The core-making process is automated. Work has been started on setting up an automated core department at the Cheboksary Tractor Plant.

A unified series of core machines has been developed and introduced in cooperation with the Ministry of the Motor Vehicle Industry and other ministries. This series covers 28 machines for core sizes of 400, 600, 800, 1000 and 1600 mm with working reservoirs having a volume of 3, 6, 16, 40 and 100 liters. Of these, 12 are universal machines, 12 are for KhTS mixtures and 4 models are for shell cores.

Automatic lines are being perfected for series and mass production of cores, now covering three types of lines with sandblast mold packing for different core sizes, and four models of lines with large-scale automation for making cores from self-hardening mixtures with mixers. In three years of the Tenth Five-Year Plan, the Pavlodar Plant has made and shipped to casting shops more than 80 core lines, 60% of them already in use.

The main thrust of progress in technology and equipment for core making is development and assimilation of automatic lines with automated systems for control of technological processes providing for the manufacture of cores with respect to all technological processes, totally eliminating heavy manual labor and atmospheric pollution, improving working conditions and increasing labor productivity by a factor of 2-3. KhTS mixtures are used for improving plasticity and fluidity, reducing the cost of compounds, shortening hardening time, maximum elimination of harmful gas emissions; ZhSS and the CO_2 process are used for further reducing the cost of mixtures, reducing molten glass, improving dislodging properties and eliminating sand pickup. A technique has been developed for making cores based on ZhSS. Manufacture of medium-sized and large-sized cores has been mechanized and automated, continuous production on automatic lines has been organized, and these lines are being made in series and mass production. A second generation of standardized core machines is being developed for making precision cores, with provisions for making cores from chemical and cold-hardening mixtures, for making shell cores. Machines in a unified series meet the requirements of all sectors, and can be used to make cores by any processes on hot and cold fixtures, with improvement of productivity by 60-80%. Vibropress and sand-slinger core machines are being developed with accelerated packing of mixtures; core machines for making one-piece cores with automatic fixture separators; core machines for making large (>100 kg) one-piece shell cores; machines and lines for making large cores by the "gimes" process; lines for small-series production and core making on the basis of the processes. Automatic lines are being developed for making cores weighing 16, 40 and 100 kg with capacity of 60 or more cores per hour from chemical hardening mixtures; new designs of rotary type mixers.

Mixture Preparation. The principal direction here is the development of highly productive (with automatic control and regulation) chaser mills, coolers for changing equipment in operation, and development of automatic mixture preparation lines for renovated and newly built shops.

In the Ninth Five-Year Plan, chaser mills were developed and produced for continuous action (hourly capacity of 80 cu. m) and for periodic action (hourly capacity of 60 cu. m), and also facilities for preparing self-hardening mixtures with periodic action (up to 12 metric tons per hour) and with continuous action (up to 30 metric tons per hour), as well as a line of individual equipment. During the Tenth Five-Year Plan,

series production was begun on seven types of automated technological complexes for mixture preparation made by franchise with National Engineering (United States) with productivity of 25, 40, 60, 160, 240 and 400 cu. m/hr. The complex includes chaser mills with capacity of up to 300 cu. m, coolers, vibration screens, aerators. Preparation of the molding mixture is done automatically, the control system is electronic, programmed regulation is provided, as well as adaptive coupling between mixers and batchers.

For molding and making cores from mixtures that harden in the fixture, the complex includes: for ZhSS-2 -- two types of facilities with capacity of 6, 8, 12, 15 and 30 metric tons per hour; for PSS -- a continuous-action unit with capacity of 20 metric tons per hour; for KhTS -- four types of mixers with capacity of 3, 10 and 15 metric tons per hour; for clad mixtures -- mixers of periodic action with capacities of 3 and 10 metric tons per hour. All equipment is made with automatic batching and an electronic control system.

During the Ninth Five-Year Plan, 5975 units of mixture preparation equipment were made with a total cost of 31 million rubles. Plans for the Tenth Five-Year Plan call for production of 30 line complexes at a total cost of 24 million rubles (such equipment has not been produced heretofore in the Soviet Union), and also 9000 units of equipment at a cost of 45 million rubles, i. e. the production volume will be more than doubled. Seventy-six model 4204 chaser mills will be made, and also 115 ZhSS facilities. Plans for the future call for development and assimilation of a series of automatic complex mixture preparation systems with automated systems for control of production processes with yearly capacity of up to 500 metric tons for making high-quality molding mixtures in the programmed automatic mode.

Special Casting Methods. The following types of equipment are to be assimilated during the Tenth Five-Year Plan: 9 standard sizes of pressure die casting machines including 6 large-capacity machines with locking force of from 800 to 3500 metric tons, and 4 with mechanization and automation of auxiliary operations; 2 standard sizes of automatic casting centers based on a pressure die casting machine; a new series of 12 standard sizes of single-position chill-casting machines with average capacity of 40 castings per hour; 5 standard sizes of automatic lines for producing castings in lined chill molds and 2 types of specialized chill-casting lines, and also 3 types of technological equipment complexes for making castings by the lost-wax method, and one set of equipment for casting with ignitable (gasifiable) patterns.

In the offing is development of automatic shops for producing castings by special methods from a variety of alloys, which will increase labor productivity by a factor of 2-3 with complete elimination of manual work. Casting by lost-wax and ignitable patterns is being developed. Equipment complexes are being made for small-series lost-wax casting: equipment

complexes and lines for precision casting using patterns made from foam polystyrene and new materials for dispensable patterns with the use of fine filtration of metals; technology and equipment is being developed for making large (>50 kg) castings by the lost-wax and ignitable pattern methods. For pressure die casting, machines are being developed with automation and regulation of all parameters of the technological process, for example with automatic dispensing of metals into the mold and with the use of computers; casting center complexes are being developed with automation of operations of metal teeming, removal and cleaning of the castings, return of waste scrap for remelting. For chill-mold casting, a new series of chill-mold machines is being developed with an increase in capacity by more than 50%. Universal machines are being developed (with mechanized disassembly of compound molds) for casting complicated parts; chill-mold machines in combination with other casting equipment.

Removal and cleaning of castings requires the development of facilities with mechanization and automation of all operations, including auxiliary operations, by: a) developing conveyer shot-blasting chambers of periodic action with monorail and rotary suspensions having a load capacity of up to 10 metric tons; b) developing conveyer and shot-blasting chambers of continuous action with continuously moving conveyers having a suspension with load capacity of up to 1250 kg; c) development of a series of equipment for dressing off the castings with the use of manipulators and programmed grinding technology; d) development of standard highly mechanized and automated casting dressing departments; e) development of machines and aggregates for grinding (instead of chipping) large and intermediate castings. Plans have been made to develop equipment complexes for finishing cast parts with the use of manipulators and automated systems for control of technological processes, with elimination of heavy manual labor for chipping and cleaning castings, improving labor productivity by a factor of 3-4.

For further improvement of casting production, the following principles should be observed in developing new techniques and creating new equipment.

With respect to new techniques: careful elaboration (before construction) of the technology and technical proposal; agreement on the technology and technical proposal with the consumer plant; verification of new technical processes on experimental runs and specimens.

With respect to development of designs for machines and lines: design of parts and components with consideration of manufacture on machine tools with programmed control; preliminary manufacture of components with checking and testing; use of new structural materials (shaped stock) to lighten machines; use of common frames for high-quality assembly of machines and components; solution of problems in biotechnology and aesthetics.

To provide extensive technological capabilities and increase the pace of development of machines and lines: attainment of a reserve capacity of 30-60% for drives and 30-40% for supply systems, automation of fixture exchange during the working cycle; universality of machines and lines.

With respect to control systems: extensive use of electronic systems, computers and programmable controllers, systems that stabilize the technical processes; development of unified control systems for grouped equipment.

With respect to repairability of machines and lines: independent removal of parts and components, use of modular components in control systems, use of modular components in the supply system; thorough comprehensive testing for service life.

In addition, safety rules should be strictly observed, as well as principles of standardization: use of unified norms, development of standardized components as a basis for assembly of machines and lines, development of a unified catalog of standardized components and parts in the casting machinery industry.

Theoretical Basis

Moscow LITEYNOYE PROIZVODSTVO in Russian No 1, Jan 80 pp 31-32

[Article by G. M. Orlov, doctor of technical sciences]

[Text] The complete theory of any type of casting machine is made up of four parts: analysis and synthesis of schematic diagrams of the machines and their components (for choosing optimum designs); theory of the technological processes to be performed by the machines (for a sound choice of optimum working conditions of the machine); theory of working processes of the machines themselves or of their mechanisms (to determine the parameters of the working elements of the machine and its working conditions); strength calculations of machine parts.

It is not always possible to distinguish between the aspects relating to the second and third parts. For instance in the case of a jolt-ramming machine the compacting of the mixture in the mold during impact can be treated independently of the working process of the shaking mechanism (piston movement), and the point of juncture of the two theories is represented by the velocities of the table at the instant of impact and recoil. On the other hand, in the case of sandblasting machines the process of compacting of the mixture in the box and the process of discharge of the mixture from the sand-blower reservoir are essentially the same process.

The first special foundry equipment, molding machines, appeared in the mid-nineteenth century, but extensive application did not begin until the

late nineteenth and early twentieth centuries. At this same time, foundries began to use mixers, screens and sand cleaners. Within 20-30 years, machines had been developed that enabled mechanization of nearly all technological areas of foundry practice. The working principle of most modern machines is no different from that of the machines of that period; it is only the capacity, productivity and outward appearance that have changed, with automatic and automated machines replacing the mechanized units.

The intensive mechanization of foundries in our nation began during the First Five-Year Plan, when large palnts were being built and put into operation: the Podol'sk Machine Plant imeni M. I. Kalinin, the Stalingrad and Khar'kov Tractor Plants, and the Rostel'mash, Gor'kiy and Moscow Motor Vehicle Plants. Research and development in the theory of casting machines paralleled the mechanization of the foundry industry. A Soviet school of casting machinery headed by N. P. Aksenov started its formation at Moscow Higher Technical Academy imeni Bauman. Aksenov's series of monographs on foundry equipment was published in 1932-1937 [Ref. 1]. These books give a systematic description of casting machines, an analysis of their schematic diagrams and design features, and recommendations on selection. In the first periodical for foundry workers, "Liteynoye delo," articles were printed on casting theory. At first, these were translations of papers by foreign scientists, and then papers by Soviet scientists [Ref. 2, 3]. In this period, particular attention was given to processes of mixture compacting with shaking and pressing, the working processes of pressing and shaking machines. N. P. Aksenov and his disciples established the principal factors of compacting action when packing molds: pressing pressure in the case of pressing, and the specific work communicated to the mold in the case of shaking; empirical equations that are still being used were found at that time for the mold density as a function of the compacting action, the density distribution of the mixture through the volume of the mold was studied as a function of the parameters of the casting flask; an investigation was made of processes of vibropressing [Ref. 1, 3], which was the predecessor of the process now extensively used that combines pressing with jolt-ramming.

At that same time, N. P. Aksenov suggested the method of approximate plotting of indicator charts for determining the optimum parameters of jolt-ramming mechanisms, and S. Z. Stolbova proposed the method of analytical solution of the equation of motion of the piston with respect to time elements of short duration [Ref. 3].

An enormous contribution to the theory of casting machines has been made by P. N. Aksenov, continuing the work of N. P. Aksenov on systematizing casting machinery and analysis [Ref. 3]. He has worked out the theoretical principles of the working processes of most specific casting machines: the sand slinger, the sand blower, the shake-out grating, the lever press mechanism, the shot slinger; additions were made to the theory of the working process of a jolt-ramming mechanism, techniques

for calculating the swivel mechanism of a casting ladle and so on [Ref. 13]. The principles of the theory of working processes of these machines have been enlarged and considerably elaborated, and the theoretical conclusions have been experimentally verified under the direct supervision of P. N. Aksenov at Moscow Institute of Automechanics by G. M. Orlov, A. Ya. Kalashnikova, I. V. Matveyenko and others [Ref. 3, 4], at the All-Union Scientific Research Institute of Foundry Machinery and Technology by L. F. Liokumovich, R. L. Geller, N. I. Zhilyayev [Ref. 5, 6], and by A. S. Yevseyev and V. L. Lesnichenko at the All-Union Scientific Research Institute of Technology in the Motor Vehicle Industry [Ref. 3, 7].

With development of Soviet casting machine building there has been a continuous increase in the pace of research on casting machines and the processes implemented by these machines, especially since the early fifties. There has also been an increase in the number of publications on the theory of casting machines in the journal "Liteynoye proizvodstvo." In addition to the cited publications, some interesting research has been done on the working process of sand-blowing and sandblasting machines at Moscow Higher Technical Academy [Ref. 8] and the All-Union Scientific Research Institute of Foundry Machinery and Technology [Ref. 9]. Proposals of rational working cycles for a jolt-ramming mechanism have been given in Ref. 10 and 4; a pressing and jolt-ramming machine has been studied at Moscow Higher Technical Academy, and an aerator has been investigated at Moscow Institute of Automechanics. Thus at the present time the working processes of practically all casting machines have been analytically described, and in nearly all cases we can calculate the dimensions of the working elements of the machine and the power of the drive if the technological parameters of its operation are given. An exception is the sand blower (sand shooter), where there is as yet no orderly theory for calculating the optimum dimensions of the sand-shooting reservoir.

Theories of the technological processes implemented by casting machines are developing much more slowly. As before, principal attention is being given to processes that originate in the mixture when preparing the mold. P. N. Aksenov was the first to give simplified analytical relations for the stresses acting in the mold in terms of the forces of inertia that arise in the mixture during ramming, and the pressing pressure; he has also found an analytical expression for pressing [Ref. 3].

In 1960-1970 a great deal of research was devoted to comprehensive study of the process of mold packing by pressing. Scientists at Moscow Institute of Automechanics and the Scientific Research Institute of Technology in the Motor Vehicle Industry are investigating different methods of pressing, the particulars of behavior of the mixture during pressing, and are working out mathematical models of the process [Ref. 3, 11-14]. Moscow Higher Technical Academy is studying the pressing process [Ref. 15-16].

A great deal of research has been done in Leningrad under the supervision of B. B. Gulyayev [Ref. 17]. However, despite the intensity of this research, it is basically only the qualitative patterns of the process and its factors that have been discovered. Up until now there has been no consensus of opinion about the optimum pressing pressure, or about the influence that the coefficient of internal friction of the mixture has on density distribution in the mold. The method given in Ref. 12 for calculating the stressed state of the mixture in the mold enables determination of the density of the mixture at any point in the mold with the pattern only for conditions of the plane or axisymmetric problems.

In recent years a number of papers have dealt with the process of mold packing by pressing with simultaneous jolt-ramming and by the dynamic pressing method. We mention only the studies done at Moscow Institute of Automechanics under the supervision of P. N. Aksenov [Ref. 18, 19], and a series of studies done under the supervision of I. V. Matveyenko [Ref. 20]. However, even in this case there has not yet been any success in getting analytical expressions that relate the density of the mixture at a given point of the mold to machine parameters: pressing pressure, impact energy; the very mechanism of mixture compaction in these methods is still not completely understood. It is assumed that in the case of dynamic compaction the mixture is compressed in the direction of action of inertial forces, and the action of these forces is added to the pressing pressure. At the same time, methods are known in which inertial forces are directed perpendicularly to the line of action of the pressing force, but in this case as well they have a positive effect on the results of the pressing process.

The status of investigation of the sand blowing (sand shooting) process of packing molds and cores is about the same, although this method of making throwaway molds in combination with high-pressure pressing is apparently the most promising. The sand-slinging compacting process proper has been inadequately studied.

A very small number of papers have dealt with problems of the technological processes of other casting machines, e. g. Ref. 21, 22. All these papers have established the mechanisms of technological processes to different extents, and in a number of cases empirical relations have been found for determining the optimum working conditions of machines. At the same time, in almost none of the cases are there mathematical analytical models for the processes, which would merely enable accounting for the influence of all factors in the most diversified combination.

Problems of automating the operation of casting machines should also be included among questions of theory: research on automatic regulation of mold compacting processes and on the development of technological principles for designing automatic machines and lines [Ref. 3, 23], research on the reliability of automatic lines [Ref. 24, 25] and on

systems for automatic distribution of the mixture with respect to the dispensing hoppers [Ref. 26-28]. At the present time research on systems analysis of machines and their components is being done at Moscow Higher Technical Academy under the supervision of O. A. Belikov. These methods enable determination of optimum design solutions based on objective data. Techniques for strength calculations of specific components of casting machines have been developed under the supervision of A. I. Gorskiy at the All-Union Scientific Research Institute of Foundry Machinery and Technology [Ref. 29].

Thus a brief and far from complete survey shows that research has been and is being intensively done in the Soviet Union in all areas of the theory of casting machines; at the same time, a number of questions remain unanswered, especially in the field of the theory of the technological processes themselves. In this connection, the journal "Liteynoye proizvodstvo" has an important part to play in acquainting a broad class of foundry workers with the problems of the theory of casting machines, and hence has and will have a predominant role in the development of this theory.

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METALWORKING EQUIPMENT

MACHINE-TOOL INDUSTRY SUMMARIZES PROBLEMS FOR 1979

Moscow VESTNIK MASHINOSTROYENIYA in Russian No 5, May 79 pp 3-8

[Article by I. I. Andrianov, director of Labor Organization, Wages and Personnel of Minstankoprom: "Problems of the Machine-Tool Manufacturing Industry in the Fourth Year of the Five-Year Plan"]

> [Text] The Plenum of the CPSU Central Committee emphasizes that progress in increasing the effectiveness of social production and quality of work is an important problem of the ministries and departments, party, soviet and social organizations and labor collectives. This struggle must be waged on a broad front--in industry, in agriculture, in transport, in construction and in other branches of the economy, in all sectors of production and administration. Particular attention should be directed at increasing labor productivity, adoption of latest scientific and practical advances in industry, utilization of modern techniques and technology, and the utilization of existing reserves and the possibilities for increasing output and increasing the technical level of production with minimal expenditures. The solution to problems which are specified in the 1979 national economic plan requires further development of socialist competition--the tested lever for multiplying the successes of labor, the viable means of the communist education of people.
>
> From a decree of the November (1978) Plenum of the CPSU Central Committee "On Projections of the State Plan for Economic and Social Development of the USSR and of the State Budget of the USSR for 1979."

Workers of the machine tool industry enthusiastically received the decisions of the November (1978) Plenum of the CPSU Central Committee, the conclusions set forth in the speech given at the plenary session by the

General Secretary of the CPSU Central Committee and Chairman of the Presidium of the Supreme Soviet Comrade L. I. Brezhnev, and the law "On the State Plan for the Economic and Social Development of the USSR for 1979" which was confirmed by the 10th Session of the Supreme Soviet of the USSR at its 9th convocation. Actualization of this plan is a new, major step in fulfilling the historical decisions of the 23rd CPSU Congress.

Complex and critical tasks were assigned to the collectives of the Ministry of Machine Tool and Tool Building Industry for the 4th year of the five-year plan. Overall the industry was asked to increase its output of commercial goods by 10.2 percent. At the same time further improvement of the output structure is expected by virtue of the increased use of advanced equipment, which allows one to make greater savings in material and labor resources.

In metal-working equipment the production of forging and pressing machines and technological equipment for casting production will achieve outstanding growth. While the increased output of metal-cutting machines will be 10.2 percent (in cost), the production of forging and pressing equipment should increase by 11.9 percent; that of technological equipment for casting production by 13.8 percent; that of automatic, semi-automatic and rolling trains of all kinds by 16.8 percent; and that of manipulators with programmed control (robots) by 160 percent.

A significant increase in the output of goods is envisaged which, in its technical and economic indices, meets the highest achievements of Soviet and foreign science and technology or even exceeds them.

While preserving the quantitative output of metal-cutting lathes at the 1978 level, the production of special, specialized and aggregate lathes will be increased by 12.6 percent; that of lathes with digital programming by 10.3 percent; and that of multi-operational lathes with magazines for automatic tool replacement by 72.8 percent.

There will be a significant increase in the output of new models of lathes and a production halt to equipment of obsolete design. The production of new models of lathes will be substantially increased at the Leningrad-Sverdlov Machine Tool Construction Production Association, at the Krasnodar Sedin Machine Tool Construction Plant, at the Gomel' Kirov Machine Tool Construction Plant, at the Yegor'yevsk "Komsomolets" Machine Tool Construction Plant, at the Lipetskiy Machine Tool Construction Plant, at the Orshanskiy "Irasnyy borets" Machine Tool Construction Plant, and at others. In 1979 the machine tool construction branch will significantly increase the output of special lathes for the Kama Automobile Plant.

Organization of the output of forging and pressing equipment will also be modified in order to permit acceleration of mechanization and automation of labor-consuming, heavy and routine operations; significantly

increase labor productivity and the precision of intermediate workpieces and to reduce metal consumption.

The amount of tools produced in comparison to 1978 will be increased: for diamonds--by 5.6 percent; for abrasives--by 7.4 percent; for metal-working tools--by 4.9 percent; and for technological fittings for machine construction--by 10.5 percent.

There will be high growth rates in labor productivity--107.8 percent--and in profits from the principal activity--119.0 percent.

The amount of capital construction will increase significantly. The total amount of capital outlays in 1979 will exceed 550 million rubles, including about 250 million rubles which will be set aside for construction and erection projects.

The fourth year of the five-year plan is a year for the further acceleration of scientific and technical progress. The plan for development of science and technology of this industry for 1979 includes 2,937 assignments, including: 814 for manufacture and testing of test samples; 778 adjustable machine banks; 252 for removing obsolete articles from production.

Completion of 139 tasks related to programs for elaboration of scientific and technical problems which have been approved by the USSR State Committee for Science and Technology is envisaged for 1979.

A further expansion of projects for developing and utilizing new models of highly efficient kinds of metal-cutting lathes, machines, equipment and tooling is scheduled, which will create conditions for improving the output structure of commodities in conformity with the demands of industry. In the category of metal-cutting lathes the adjustable series of machines must be introduced: 25 models of lathes with digital programming; 137 models of automatic devices and semi-automatic devices of all technological groups; 43 models of lathes with high and very-high precision; and 35 models of large, heavy and unique lathes. In the 1979-1980 period more than 50 plants of the industry will complete about 300 assignments for developing and introducing new metal-cutting lathes, which are equipped with automated means of loading.

Projects will be completed for creating digitally programmed lathes of increased precision, for equipping them with devices for automatic replacing workpieces, for introducing digitally programmed lathes with operative symbol-digital keyboard control; for the creation of high-production automated and semi-automated devices with varying technological purposes for large-scale production sectors of the industry; for the introduction of lathes with high and very high precision, which are

equipped with digital read-out devices and accurate counting-measuring systems; for the creation of large, heavy and unique lathes which assure complex turning of parts from one installation.

In the category of pressing and forging machines 43 models of adjustable, automated equipment complexes and new automatic devices and machines with means of automation are to be introduced. Eight models of pressing and forging machines and sets with programmed control, 11 models of heavy and unique machines, and 25 models of pressing and forging machines and sets for making accurate workpieces will also be introduced in this category.

For preforming production qualitatively new complex automatic lines will be created, including: for the manufacture of castings in forms from self-hardening mixtures with casting-box size 2000 x 1600 mm, for non-casting box forming with assembly in a vertical stack with form sizes 600 x 500 mm with a production rate of 600 forms per hour; automated rod machines will be created manufacturing rods in heated rigging; automatic lines and automatic complexes for making precision castings in skin-dry molds, and also in ceramic molds (on polystyrene foam extruded models).

The creation of complex, mechanized equipment for the production of lumber, in particular a milling-sawing line for simultaneous fashioning of logs into lumber and waste products into technological chips, is envisaged for the woodworking industry. Introduction of equipment complexes for mechanization and automation of the technological processes of manufacturing furniture is planned: mechanical treatment, assembly, staining, etc.

In the tool, abrasive and diamond industries projects for introducing new kinds of instruments will be continued, including: instruments equipped with multifaceted disposable blades of cubic boron nitride polycrystals, inserted-blade facing mills with diameter of 300-600 mm with mechanically tightened hard-faced blades, which feed up to 2000 mm per minute; new kinds of diamond tooling which chiefly use the new brands of synthetic diamonds SV, ASPK, AS-65 with improved physical and mechanical features; mounted abrasives of improved quality and efficiency, which work at cutting speeds of 80 m/s.

In 1979 the overall industry portion of output in the highest quality category should reach 32.5 percent in place of 23 percent for the 1978 plan. Increasing the output of goods in the highest quality category is planned for all VPO [military consumer's society (?)], in particular: for Soyuztyazhstankoprom 40 instead of 25.5 percent in 1978; for Soyuztochstankoprom 40 instead of 27.6 percent; for Soyuzdrevstankoprom 25 instead of 19 percent; and for Soyuzkuzmas 33 instead of 23 percent.

The solution of the problem of increasing the output of goods in the highest quality category depends directly on the work of enterprises and production associations, in the areas of preparation and attestation of goods for the state sign of quality. In 1979, 221 articles were submitted for attestation for the state sign of quality, and 218 for reattestation.

In 1979, according to the plan for new technology, 84 measures are envisaged for technical reinforcement of enterprises, the introduction of advanced technology and mechanization and automation of production processes, including 21 measures for interbranch matters. As a result of the realization of these measures there should be assured an increase in labor productivity of 3.5 percent; about 17,300 workers should be provisionally set free; 35 million rubles from reduced production costs should be saved.

An important place in the plan is devoted to increasing the technical level of preforming production. Plans to introduce advanced technology into casting production call for reaching a volume for cast-iron casting, which is melted in induction furnaces, of up to 97,500 tons instead of 83,800 tons in 1978; casting from cast iron melted by the duplex process of up to 12,000 tons (in 1978, 8,000 tons); casting, obtained by special methods (chill mold, by melted models, under pressure, continuous, etc), of up to 134,500,000 tons (in 1978, 124,300,000 tons); casting into molds of self-hardening mixtures of up to 677,000 tons (in 1978 it was 647,000 tons); complex-mechanized production of casting of up to 920,000 tons (in 1978 it was 878,000 tons). It is planned to obtain 192,000 tons of workpieces in forging industry by methods of scrapless cutting, which will comprise 67 percent of all workpieces used in this field.

The volume of precision bulk stamping will comprise 66,700 tons in comparison with 61,000 tons in 1978, or 54 percent of the amount of stamped forgings. In addition there will be a switch to an advanced method of longitudinal-helical rolling for 9 million drill bits, whose total quantity will be 138 million pieces. Introduction of this method will permit one to reduce steel consumption by 30-50 percent and to reduce the man-hours of drill bit manufacture by 15-20 percent.

It is expected that the level of mechanization of welding operations will reach 58 percent (it was 56 percent in 1978) by utilization of 88 installations for mechanized methods of welding and of other equipment. An extensive program of projects in the area of "Development of scientific and technological principles and testing of complex recommendations for the manufacture of welded basic parts of lathes, machines and equipment" will be completed by VISP [All-Union Welding Institute], Electric Welding Institute imeni Paton of the Ukrainian SSR Academy of Sciences, NPO [Nongovernmental organizations] of ENIMS [Experimental Scientific Research Institute of Metal-Cutting Tools], ENIKmash [Experimental Scientific Research Institute of Forging-and-Pressing Machinery], VNIIDMASh

[All Union Scientific Research and Design Institute of Woodworking Machinery], NPO of VNIIlitmash, main Design Offices, and by industry enterprises in order to intensify the transition to welded lathe and machine parts in 1979.

Further expansion of mechanical machining of parts on lathes with digital programming will be accomplished in 1979 at enterprises of the industry by introducing 900 lathes with digital programming (750 lathes in 1978). There are plans to reorganize 30 sections with digital programmed lathes and to bring the total number of such sections to 260. In this way 12 sections will be organized for the preparation and setup of tooling for lathes with digital programming.

There are plans to install three integrated-automated sections of lathes with digital programming, which are controlled by computers at the following plants: The Sasovskiy Plant of Automatic Lines, the Ryazanskiy Machine Construction Plant and the Vil'nyusskiy Machine Construction Plant "Zhal'giris."

The use of production-line methods will be expanded. In 1979, 136 mechanized production lines will be introduced (107 lines in 1978). Each of these lines will increase labor productivity by 25-35 percent with relatively small expenditures.

In order to improve the structure and modernization of existing metal-cutting lathes there are plans to acquire and begin to operate 1,360 high-production lathes, 300 high- and very high-precision lathes, and to replace 2,500 units of old and obsolete equipment.

Machine tool industry workers have enthusiastically greeted the call of the November (1978) Plenum of the CPSU Central Committee for greater socialist competition in searching for and actualizing production reserves; in the widespread introduction and dissemination of new techniques to encourage those lagging behind to catch up. A decree of the Plenum pointed out that the strength and effectiveness of competition consists in the fact that each worker be highly productive, be eager to fulfill production tasks, and accept socialist obligations and counterplans both in quantity and in quality. "Work without laggards" is the motto of socialist competition of the industry's workers in 1979.

In responding to a resolution of the November (1978) Plenum of the CPSU Central Committee and of the 10th Session of the Supreme Soviet of the USSR in specifics, teams of advanced production and scientific-production associations, enterprises and organizations of the industry have organized an intense search for production reserves, have developed comprehensive measures for putting them into operation and have adopted rigorous socialist obligations for 1979 on this basis.

Workers at the Moscow Machine Construction Plant imeni Sergo Ordzhonikidze agreed to fulfill the 1979 plan ahead of time and the five-year plan for growth rates of production volume and labor productivity by the 110th anniversary of V.I. Lenin's birth. While supporting the initiative of the Red Proletarians, a team of the plant planned to increase the portion of goods with the state sign of quality to 50 percent, including issuing a set of complex automatic production lines of the highest category for the Kama Automobile Plant. More rigorous responsibilities were adopted for economy of metals, of all kinds of energy and other resources, and for streamlining production in 1979.

The staff of the Zaporog Abrasives Combine imeni 50th Anniversary of the Soviet Ukraine committed itself to fulfill the tasks of the 1979 state plan ahead of time and the five-year plan by the 110th anniverary of V.I. Lenin's birth. It also planned to assure a growth in the volume of goods production in 1979 of 5.9 percent more than for 1978; to produce 450,000 rubles more worth of goods than the plan calls for and 1.9 million rubles more in all since the beginning of the five-year plan; to bring the production of goods bearing the state sign of quality to 42 percent of total output in 1979. The personnel of the combine resolved to save 5 million kilowatt hours of electric energy in the 4th year of the five-year plan and to achieve an annual savings of 280,000 rubles by the introduction of efficiency suggestions and innovations. The staff makes use of the possibility for increasing the production of goods used in the national economy. It has been decided to issue 1 million rubles more worth of popular consumer goods than in 1978 (an increase of 7.1 percent).

Workers of the Tiraspol'skiy Casting Machine Plant imeni Kirov decided to fulfill the plan of the first 4 years of the five-year plan by 7 October 1979, the day of the second anniversary of the adopted new Constitution and to manufacture 11 million rubles' worth of various articles in excess of the plan before the end of the year. The staffs of the billet-welding, assembly and tool shops of 5 sections of 20 brigades and more than 1,000 other workers pledged to fulfill the five-year assignment by the 110th anniversary of V.I. Lenin's birth.

More than 1,000 production workers and 64 brigades of the Kiev Machine Construction Production Association took on increased socialist commitments to complete the assignments of the 10th Five Year Plan by 22 April 1980.

The patriotic initiative of the staffs of the above-mentioned production associations, enterprises, brigades and workers which took on increased commitments in response to resolutions of the November (1978) Plenum of the CPSU Central Committee and of the 10th Session of the USSR Supreme Soviet, was sanctioned by a board of the Ministry of Machine Construction and the Presidium of the Central Committee of the trade union of machine and tool construction workers and found broad support among all workers of the industry.

Having completed the State Plan and the socialist pledges for 1978, the production staffs and the industry as a whole adopted intense commitments for 1979. The main focus of these commitments is concentrated on the practical resolution of problems of increasing production efficiency and work quality by each enterprise, shop, section, shift, brigade and all workers; on assuring fulfillment and overfulfillment of assignments for production output in the established nomenclature; in growth of labor productivity; in achievement of high production results with relatively low consumption of metal, raw materials, fuel, electric energy; in rational use of fixed capital, each unit of equipment, financial and labor resources; contraction of losses due to breakage and other nonproduction expenditures; lowering costs of production; and improving all technical and economic indexes of production activities.

The socialist commitments of the staffs of production associations and enterprises are backed up by commitments of the staffs of shops, sections, brigades and of each worker. For example, a brigade of electricians of the Moscow Automatic Production Line Plant imeni 50th anniversary of the USSR, headed by YU. V. Starshinov, made a commitment to fulfill the 1979 plan by the 62nd anniversary of the Great October Socialist Revolution; to increase labor productivity by 10 percent and thereby assemble 9 electric cabinets in addition; turn over all manufactured goods at the first request; and to fulfill the five-year production assignment by the 110th anniversary of V.I. Lenin's birth.

The Komsomol youth brigade of the Vitebsk Machine Construction Plant imeni Komintern, headed by V.F. Moiseyenko, pledged to complete the 10th Five-Year Plan by 22 April 1980 and to work according to the principle: "One hundred percent production without defects."

"Collective responsibility and the worker's guarantee of high quality of VGK [expansion unknown] transmissions by means of automatic inspection of all assembly operations and testing of all assembled connections" is the working motto of a brigade of fitters of mechanical assembly projects in the screw coupling shop of the Odessa Precision Lathe Plant imeni 25th CPSU Congress, headed by V.M. Arvat.

The integrated brigade of Mechanical Shop No 1 of the Orenburg Machine Construction Plant headed by P.I. Sukhorukov resolved to work in the 10th Five-Year Plan by the motto "Assurance of quality from conception to finished product." After discussing its options and outlining a set of steps, the brigade collective adopted a counterplan for 1979 and pledged to put out 11,000 rubles' worth of manufactured goods in addition to the plan, and it also pledged to fulfill the five-year assignment by the 110th anniversary of V.I. Lenin's birth.

A brigade of fitters and electricians of the assembly shop of the Minsk Machine Construction Plant imeni S.M. Kirov headed by V.D. Sergeyev, pledged to assemble five 7B55 model lathes in excess of the quota in 1979, to increase labor productivity in comparison with 1978 by 14.3

percent (the plan calls for 10.2 percent), to turn over all goods at the first request, to work by the motto "From a model work station to a model shop, to the enterprise" and to earn the title "Model brigade."

The following units have pledged to fulfill their assignments for the 10th Five-Year Plan by the 110th anniversary of V.I. Lenin's birth: a brigade of milling machine operators of the Ul'yanovsk Heavy and Unique Lathes Plant headed by the Lenin Komsomol Prize laureat A.N. Chigirev; a brigade of the No 4 equipment shop headed by communist N.V. Mikhaylov, and a brigade of the shop of automatic control and measuring devices headed by A.G. Koshurin of the Moscow Instrument Plant "Kalibr"; a brigade of fitters and assemblers of the Moscow Machine Construction Plant imeni Sergo Ordzhonikidze, directed by Hero of Socialist Labor V.G. Komarov; a brigade of fitters of the assembly and adjustment section digitally programmed lathes of the Minsk Production Association for manufacturing automatic production lines imeni 60th anniversary of the Great October, headed by V.S. Shvankov, and many others.

In addition to their pledges to fulfill established production assignments and personal (brigade) plans ahead of schedule, to assure work quality improvement, to increase labor productivity in excess of the plan collectives of brigades and workers are committed to adopt technically based standards, to lower the labor consumption of production, to increase their abilities and skill, to master related skills, to achieve economies in consumption of metal, materials, electric power and to actively participate in improving efficiency and innovativeness.

Engineering and technical colleagues and employees will take on commitments in their plans to achieve better results during development and assimilation of new machines, devices and equipment, advanced technological processes, to accelerate automation and mechanization of production, to shorten manual and labor-consuming operations, to obtain reductions of metal and materials consumption in production, to accelerate the introduction of scientific and technological advances into production, to improve labor organization and to render practical aid to workers in fulfilling their socialist commitments.

Through the socialist commitments of the industry it is intended to assure early fulfillment of the scheduled assignments for 1979 and for the five-year plan as a whole for increasing production quantities, for creating and introducing new technology; to assure more highly effective achievements from the results of economic activities.

A particular feature of the socialist commitments for 1979 is the fact that the collectives have set as their task to fulfill 54 percent of the annual scheduled assignment for making test samples and for assimilating adjustable series of technological equipment in the first half year.

An important condition of successful fulfillment of the plan is definite elimination of shortcomings which inhibit progress. Their analysis at the November Plenum of the CPSU Central Committee undoubtedly will serve as the starting point for improving operations in all collectives, including those sections which require special attention from party, Soviet and economic organs. One of such sectors is the production of popular consumer goods. Increased output, expanded variety and increased quality of these commodities is a crucual problem.

According to the socialist commitments the output of these commodities by the industry should increase by no less than 13 percent. Production of 35 designations of new kinds of these commodities should be assimilated within 1 year. Considering the lag in fulfillment of the plan for manufacture of popular consumer goods in 1978, the collectives of enterprises, VPO and the central apparatus of the Ministry have decided to take special note of fulfillment of the socialist commitments for this category.

Resolutions of the November (1978) Plenum of the CPSU Central Committee require that each work collective create an atmosphere of friendly creative searching for the most effective ways to achieve the high end results of production. In doing so it is important that everything new and advanced, which is generated by the initiative of workers, be widely disseminated.

Taking all this into account, a set of measures have been adopted in the industry which are directed at increasing the level of organizational and engineering work in studying and disseminating advanced experience of the competing groups, and for selection and introduction of the most effective experience, which will encourage the best realization of decisions of the 25th CPSU Congress and the assignments of the 10th Five-Year Plan. Among these measures are improvement of the work of advanced schools and schools of communist labor; introduction of a system to assure rapid transmission of methods and work procedures of the winners of socialist competition to other workers; the creation of competitive organization, technical and economic conditions necessary for successful fulfillment of adopted socialist commitments by them; and the assurance of timely deliveries of casting material, intermediate products and auxiliary articles to plants.

It is also necessary to improve the practical aspects of organizing competition and making use of its results to assure good publicity for the competition and to make use of all measures for stimulating its victors. In addition to determining the victors of competition there should be an evaluation of the activities of the collectives and workers who have average and low scores and to find and adopt measures to eliminate factors which interfere with work.

In this situation one must be guided by directives which were given in a speech of the General-Secretary of the CPSU Central Committee, the

Chairman of the Presidium of the Supreme Soviet of the USSR comrade L.I. Brezhnev at the November (1978) Plenum of the CPSU Central Committee to the effect that the management of competition and introduction of new advances is a vital matter which should not be delayed.

Successful fulfillment of plans and the socialist commitments for 1979 will create a reliable reserve for fruitful labor in the next year of the five-year plan. Each competitor understands that fulfillment and overfulfillment of the plan of the 4th year of the five-year plan and of the adopted commitments will assure continued realization of the social and economic program adopted by the CPSU Congress.

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METALWORKING EQUIPMENT

PROGRESS, TASKS FOR MACHINE BUILDING INDUSTRY

Moscow VESTNIK MASHINOSTROYENIYA in Russian No 11, Nov 79 pp 3-6

[Article: "More Highly Productive Equipment for the National Economy"]

> [Text] Workers of industry! Fight for further development and strengthening of industrial power of our Motherland! More quickly assimilate and effectively use the production capacities! Bring in new techniques, advanced technology and the leading experience!
>
> (From appeals of the CPSU Central Committee on the 62nd anniversary of the Great October socialist revolution)

All branches of industry are dynamically developing in the 10th Five-Year Plan in conformity with resolutions of the CPSU 25th Congress. Improvement of interbranch proportions are being accomplished and, in particular, as was envisaged, machine construction and metal machining have experienced outstanding development.

Overall the volume of machine construction and metal machining goods produced increased by 30 percent in 3 years of the five-year plan. The output of machine construction and metal machining goods has exceeded the five-year plan assignments by 5 billion rubles. This increase in the volume of goods produced has been accompanied by an improved delivery structure, more frequent modernization of it, and also creation and assimilation of new kinds of articles. In these 3 years, production has been mastered and serial output of 8,100 new kinds of machines, equipment and devices has begun. Fifty-five hundred articles of obsolete designs have been removed from production.

Hundreds of new articles with high technical and economic parameters have been created and are undergoing development in every branch of machine building.

Workers engaged in energy-producing machine building industry increase the delivery of equipment every year for atomic powerplants under construction. Energy-producing machine building enterprises manufactured dozens of huge hydroturbines in 1976-1978, including hundreds of steam turbines for Ust'-Ilimskaya, Zeyskaya, Sayano-Shushenskaya and other GESes. A unique power unit with a capacity of 1.2 million kW was made for the Kostromskaya GES, and equipment was delivered for the Kursk, Chernobyl'skaya, Leningrad and other atomic electric power stations. This year delivery will be completed for equipment of Unit No 5 with an output of 1 million kW for the Novovoronezh nuclear power station. It is intended to supply the Beloyarskaya nuclear power station with a power unit having an output of 600,000 kW provided by a fast breeder reactor. Atomic power is receiving all the necessary equipment in large amounts. During this year the equipment for atomic electric power stations should increase by 18 percent. New production possibilities have been opened up with operation of the first line of the Volga-Don plant "Atommash" which will put out reactor equipment with capacity of 3 million kW. The production capacities of other large turbine-construction associations have also been increased. Scientific and technical workers of energy-producing machine building industry are busy creating new units which have great national economic significance.

Associations and enterprises of the Ministry of Heavy Machine Building are making deliveries of large amounts of modern equipment for heavy industry enterprises. For example, equipment of the oxygen-converter shop of the metallurgical plant "Azovstal'" was manufactured in 1976-78. The equipment includes converters with capacity of 400 tons and machines for continuous casting of billets with production output of 1 million tons per year. Also manufactured were an all-purpose installation for rolling wide-strip beams, a unique stamping hydraulic press with a force of 65,000 tons and other custom-made equipment.

High rates of growth were achieved during the current five-year plan by enterprises of the Minpribor. The total production volume increased by 36 percent in comparison with that of 1975. This is greater than was envisaged by the assignment of the five-year plan. The production of computer devices increased at even higher rates during this period. Much attention is being devoted to the development of devices, means of automation and computers on a microelectronics base.

The production of technical means for ASUP [automated enterprise management system] grew significantly in the past 3 years. The output of small computers, which make up a single system (SM EVM [calculator-computers) for all socialist countries is growing, and the output of modern peripheral equipment for computers and management computer complexes is being assimilated.

In the 10th Five-Year Plan the branch of chemical and petroleum machine building will conduct research on creation and assimilation of the output

of principally modern equipment, which will permit intensification of the production processes in the chemical, tire, rubber, and paint industries. More than 1,900 kinds of machines and equipment have been produced in the first 3 years of the five-year plan. A highly effective system of equipment delivery has been developed in this branch. This means delivery to customers of completely assembled equipment which is ready for installation and setup. Savings in excess of 100 million rubles in 1978 alone were achieved by such fully assembled deliveries of equipment lines, assemblies and installations.

The automotive industry has been increasing its rates of output from year to year. In the 1976-1978 period 6,264,000 vehicles were manufactured. According to the plan for 1979, 2,178,000 trucks, light vehicles and buses will be made.

The production of new vehicles is being mastered. Thus, the association "BelavtoMAZ" will prepare a line of vehicles with hauling capacity of 110 tons for testing. Last year the production line output of modernized 8-ton vehicles in the class MAZ-5335, and the light vehicle ZAZ-968M and others, began.

Many programs for introduction of new vehicles and other articles is going on this year too. More than 30 designations of products still must be assimilated. These are the 28-ton MAZ tractor-trailer rig, the ZIL diesel tow trucks with carrying capacity of 10 tons, and the multi-axle 20-ton automatic dumptruck of MAZ for use in Siberia and the Far East.

The machine tool industry, while carrying out the resolutions of the CPSU 25th Congress in the area of supplying the machine building industry with highly productive metal-working equipment and tooling, is taking strong measures to improve the organization of the output of goods, to expand production of automated equipment and to assimilate a large inventory of new articles with high technical parameters. Overall 707,000 metal-cutting lathes and more than 161,000 tons of forging and pressing equipment have been manufactured throughout the country in the first 3 years of the five-year plan. This is a significant contribution to the supplying of new production projects and to technical refurbishing of existing enterprises. The production of equipment with numerical preset control, of automatic and semi-automatic devices and lines is being developed at the fastest rate. The following essential changes in the organization of output can be observed: in 1975 the relative significance of lathes, automatic and semi-automatic devices of all groups was 22.8 percent of the total production of Minstankoprom (by pieces), and in 1980 their output will reach 30 percent; 1.8 and 3.2 percent respectively for digitally programmed lathes. In the last 3 years the output of digitally programmed lathes grew by more than 30 percent. Among them the portion of the more complex, multi-operational lathes with magazines for automatic replacement of tools is increasing. Large orders for special and ganged lathes and

for transfer lines are being filled by machine construction workers for many enterprises of the automobile industry, and of the tractor and agricultural machine construction.

A continuous process of improving the technical level and quality of goods is accompanying the improvement of the organization of goods delivery and assimilation of new articles in all branches of machine building. This is reflected especially in the increased proportion of articles in the highest quality category in the total output of ready-to-use goods. At the beginning of 1979, 12,800 designations of machines, equipment, apparata and devices carried the state sign of quality. Regarding work being done in this direction we can learn a great deal from the following data: according to Minkhimmash, in 1975 the portion of goods in the highest quality category was 7.8 percent of the total output of ready-to-use goods, and it was 23.6 percent in 1978; for Minstankoprom it was 7.6 and 24 percent respectively; for the Ministry of Machine Building for Light and Food Industry and Household Appliances it was 6.8 and 18.9 percent; for the Minpribor Construction it was 8.5 and 25.3 percent; for the Ministry of Power Machine Building it was 12.0 and 22.4 percent.

In the automobile industry the portion of goods with the state Mark of Quality in the total volume of goods reached 37 percent; in the association "AvtoVAZ" the portion of goods in the highest quality category is 79 percent of total output, in the association "ZIL" it is 74 percent, and it is more than half in the associations "GAZ," "BelavtoMAZ," at the Kutaisskiy automobile plant, and at the Pavlovskiy and Kurganskiy bus plants.

Increasing the volume of output of technology, which is necessary for technical refurbishing of branches of the national economy depends on more complete utilization of existing production capacities, acceleration of introduction of facilities under construction and further expansion of the industrial and production capital base. Much work is going on in this area. Dozens of large, modern enterprises have been put into operation during this five-year plan, and many enterprises have been redesigned and technically refurbished.

A positive result in this area is the increase in the relative share of the industrial and production capital for machine building and metal working in the total capital supplied for industry. In 1970 their share was 20 percent, in 1975 it was 21.5 percent, and it grew to 22.5 percent in 1977. The inventory of machine building equipment was augmented by highly productive metal-working equipment. Metal-cutting lathes with numerical preset control were more widely used. The number of working transfer lines at enterprises of machine building and metal-working industry increased by 28 percent in the 1975-1977 period. All this helps to increase labor's available power and, in the final analysis, the growth of labor productivity. An important condition for carrying out plans for the output of

machines and equipment is the improvement of utilization of existing production capacity and acceleration of introduction of new facilities into operation.

Tasks of the 4th year of the five-year plan are being resolved smoothly. Results of work in the first half-year for the great majority of machine building ministries correspond to scheduled assignments and there is every reason to believe that the goals of economic development will be filled and overfilled this year.

In the first half-year of 1979 further growth of the economy of the country and the national prosperity will be achieved.

The volume of production of machine building and metal-working increased by 8 percent in comparison with the first half-year of the past year. The highest growth rates for output of goods were made by collectives of enterprises and organizations of the Minpribor and Ministry of Automotive Industry (9 percent with respect to the first half-year of 1978), by the Ministry of Machine Tool and Tool Building Industry (8 percent), and by the Ministry of Chemical and Petroleum Machine Building (6 percent).

The national economy absorbed a large amount of various modern equipment and machines. In the first half-year the following quantities were manufactured: turbines with total capacity of 8 million kW, 9 million kW capacity of generators for turbines, 25 million kW of AC electric motors, 148 million rubles' worth of blast furnace, steel smelting and rolling mill equipment, 372 million rubles' worth of chemical equipment and spare parts for it, and 645 million rubles' worth of technological equipment, including spare parts, for the light and food industries. Rolling stock is being increased: 1.9 million horsepower increase of mainline diesel locomotives; 1.7 million horsepower of mainline electric powered locomotives; 33,200 freight cars. Automobile plants produced 1,082,00 automobiles. Agriculture received 276,000 tractors and 1.3 billion rubles' worth of agricultural machines. There were 115,000 modern, metal-cutting lathes and 28,000 forging and pressing machines manufactured. This is far from a complete list of the volume of technology entering the mainstream of branches of the national economy.

In addition, as the results of the first half-year show, individual machine building ministries permitted delays in assimilation and output of a large number of large machines and equipment for the outfitting of enterprises of heavy industry, agriculture and transport. The introduction and development of new production capacities is also not being managed satisfactorily. Possibilities for economy of material resources, particularly in metal-rolling, are not being completely utilized.

An extensive program of further development of machine building, of improvement of the efficiency of machine building production, of the

technical level and product quality was proclaimed in a decree of the CPSU Central Committee and the USSR Council of Ministers "On the Further Development of Machine Building in 1978-1980." Complete realization of assignments of this decree is a basic task of machine building workers.

Given the current situation of labor resources in the national economy particular attention should be paid to accomplishment of the entire set of projects which assure creation and assimilation of machines, equipment, devices and means of automation of production in the period up to 1985 no less than 1.5-2 times greater than the 1975 level. Solving the problem of significant further growth of labor productivity by increasing its mechanical provisioning and energy availability will necessitate, in turn, overcoming the accumulated lag of machine building behind the demands of the national economy, which Comrade L.I. Brezhnev mentioned in a speech at the November (1978) Plenum of the CPSU Central Committee. Accelerated introduction of production capacities is needed in machine building sectors, as is modernization of the existing stock of metal-working equipment, which will require radical improvement in the organized output of this equipment and an increase of its productivity by a factor of 1.5 to 2.0.

Two glorious anniversaries were taken note of in our country in the first half of 1979.

The first is the 50th anniversary of the 1st Five-Year Plan for the development of the national economy of the USSR. In the Decree of the CPSU Central Committee "On the 50th anniversary of the 1st Five-Year Plan of the Development of the National Economy of the USSR" the greatness and importance of the socialist five-year plans, with which the impressive results were achieved by our country in all branches of social development, are clearly revealed. The outstanding historical importance of the 1st Five-Year Plan consists in that it established the starting point for application of five-year assignments as the basic form of economic planning, changed them into a great organizational and mobilizing force of communist construction, and showed the practical superiority of socialist methods of guiding the economy to capitalistic ones.

A heroic struggle of the Soviet people for actualization of the program of the 1st Five-Year Plan was unfolded 50 years ago under the leadership of the Communist Party. This struggle occupied first place in realization of Lenin's program for construction of socialism in the Soviet Union. Realization of the 1st Five-Year Plan assured creation of a strong material foundation for construction of socialist society.

Later, by continuously carrying out five-year plans for development of the national economy, the Soviet people under the leadership of the Communist Party brought about spectacular growth rates of the economic and social transformation and growth of the power of our country. A powerful economic and scientific and technical potential of mature socialism was created in our country.

At the present time the Soviet Union controls a huge national wealth, reaching more than 2 trillion rubles (not counting the cost of the land and forest). This has come about in spite of the huge losses suffered by the country in the Great Patriotic War, which were about 30 percent of the national wealth. The volume of industrial production in the Soviet Union currently exceeds the 1928 level by a factor of 128. The prosperity of the Soviet peoples is increasing from five-year plan to five-year plan, the real income of the people and payments and privileges from social funds are growing, national education and health protection are being developed continuously, and labor and living conditions of the Soviet peoples are improving.

The conception and formation of Soviet machine building owe their origins completely to the realization of the 1st Five-Year Plan.

The Communist Party, by developing and realizing Lenin's plan of industrialization and of the development of heavy industry--the foundation of economy--firmly and continuously worked for the creation of powerful base of Soviet multifaceted machine building industry. The 14th Congress of the All-Union Communist Party (bolshevik) in December, 1925 adopted exceedingly important decisions, which determined the general development of the machine building industry. The Soviet Union had to change from a country which imported machines and equipment to a country which could produce them in such quantities that she would no longer be dependent on the capitalist economy. In the 1st Five-Year Plan, as in succeeding ones, this important branch of the national economy was developed at ever faster rates. In the years of the 1st Five-Year Plan (1929-1932) the average annual growth rates for gross production for all industries was 19.2 percent, and for machine building and metal-working it was 41.3 percent. Branches were created which had not existed formerly: tractor assembly, automobile assembly, machine tool manufacturing, agricultural, chemical, mining, and metallurgical machine building, and the aviation industry.

The farsightedness of party policy played a decisive role in the preparation of our industry for wartime conditions. The high level of machine building development in the years of the 1st five-year plans enabled us to quickly learn how to build up the equipment and military stores. In the years following World War II machine building was developed and now is growing at enormous rates.

The figures which characterize the growth rates for the total volume of goods produced in the 1940-1978 period are shown below (comparison is made to 1940):

	1940	1965	1970	1975	1978
Entire industry	1	7.9	12	17	20
Machine building and metal working	1	16	28	49	64

In the 9th Five-Year Plan alone the volume of machine building goods produced increased by a factor of 1.7.

The portion of machine building and metal-working in the total volume of capital outlays to industry is constantly increasing and it was 15.3 percent in 1965, 21.3 percent in 1970, and 24.2 percent in 1977.

Machine building workers are making a large contribution to the buildup of an economic potential of the country and to the technical refurbishing of the national economy. This leads, in particular, to a constant increase of the availability of energy and electric power for labor in industry and in agriculture. In comparison with 1928, the power availability for labor in industry grew by a factor of 18 by 1978, and electric power available grew by a factor of 28. The energy availability per worker in agriculture in 1978 was 22 horsepower against 0.4 horsepower in 1928.

The production apparatus of the economy is improving. Expenditures for equipment and tooling is receiving a larger share of the capital outlays, i.e., of the nonfixed part of the basic production reserves. The number of production lines and transfer lines in the country is constantly increasing. By the end of 1978 there were more than 155,000 of them in industry, the number of completely mechanized and automated sections, shops and production groups was about 80,000, and there were about 55,000 units of equipment with programmed control.

Technical outfitting of our agriculture is based completely on Soviet machine building goods. At the end of 1928 there were 27,000 tractors in all in agriculture, but by the end of 1978 there were 2,530,000; there were respectively 2 and 700,000 grain harvesters; there were 700 and 1,563,000 trucks. In 1978 alone, 576,000 trucks and other agricultural vehicles were manufactured for an overall total of 2.5 billion rubles' worth.

The solution of problems set for machine building by the 25th Congress of the CPSU will permit acceleration of scientific and technical progress and assurance of increased efficiency of public production.

One more glorious date--the 30th anniversary of the day of the formation of the Council for Mutual Economic Assistance (CEMA)--was noted in the first half of this year in the Soviet Union and the fraternal countries of socialist cooperation.

The formation of the world's first organization of socialist states was an event of historical importance, one which played a large role in strengthening the positions of world socialism in the international arena. As the general secretary of the CPSU Central Committee, Chairman of the Presidium of the Supreme Council of the USSR Comrade L.I. Brezhnev noted in his welcoming remarks to participants of the anniversary 33d Session of CEMA, which took place in June of this year in Moscow,

socialist economic integration has transformed into an integral feature of the life of our cooperation, into a powerful and stable factor of multilateral progress of fraternal countries.

The fundamental advantages of socialism and of a new kind of international relations found their expression in the fact that in 1951-1978 the growth rates of national income and of commercial production of the CEMA member countries were three times greater than in the developed capitalistic countries. Thirty years previously, the CEMA member countries produced 18 percent of world commercial production, and now approximately one third. Previously they had 15 percent of world national income, and now they have 25 percent.

In recent years the CEMA member countries are vigorously realizing the complex program of further deepening and improvement of cooperation and growth of socialist economic integration which was adopted in 1971.

Mutual cooperation serves as a reliable source for satisfaction of demands of the national economy for the import of raw materials, fuel, machines and equipment, and popular consumer goods. Thus, in 1977 by virtue of the mutual deliveries the CEMA member countries satisfied their demands for 63.5 percent of machines and equipment, 95.8 percent of hard coal, 74.4 percent of crude oil, 77.7 percent of manganese ore, 89.8 percent of cast iron, 63.5 percent of rolled ferrous metals, 87.4 percent of aluminum and 66.4 percent of cotton. Deliveries of machines and equipment increased by almost 40 times from 1950 to 1977.

An important factor in raising the economic effectiveness of CEMA member countries is the machine building industry. At the present time the European CEMA member countries alone produce about one third of the world production of machines and equipment. The portion of machine building goods in the total volume of industrial production is from 25 to 40 percent in the CEMA countries. In the first 2 years of the current five-year plan the output of machine building goods for CEMA member countries grew by 20 percent, and the average growth rates were 1.5 times greater than the growth rate of all industry.

The structure of machine building industry is improving every year, its technical level is increasing, and the performance of the goods is getting better. This is having a positive effect on the export-import growth for machine building goods.

Deliveries of machines and equipment from the Soviet Union are a significant factor in the development of the economy of the socialist countries. They satisfy about one-third of the import demands for these goods. Many of the largest enterprises of the leading branches of the socialist countries are equipped with Soviet equipment. Shipments of tractors and agricultural machines from the USSR contribute significantly to the improvement of agriculture.

The portion of machines and equipment and of means of transport in USSR exports to CEMA member countries should increase to 27 percent versus 22.1 percent in 1975.

In turn, the other CEMA member countries, in an ever-increasing volume, ship to the Soviet Union various kinds of industrial equipment, machines, means of transport, which now make up more than 42 percent of imports of the Soviet Union from these countries. These shipments play an especially important role in satisfying the demands of the USSR in railroad rolling stock and in ships, in material-handling, power and electrical equipment.

It is envisaged that shipments of machines and equipment will undergo dynamic change as there is progress in modern, scientific and technical fields. Machine tooling, instrument making, and production of equipment for the power and chemical branches of the industry have become leading branches in a number of countries. The volume of electrical and electronic equipment production is growing at rapid rates.

One of the important directions of the integrational cooperation of CEMA member countries is the intergovernmental specialization and cooperation in production in the machine building industry. In the machine building field there are about 80 multilateral agreements, which affect the production of goods of more than 8,000 designations. Specialization and production cooperation embrace the manufacture of power equipment, electronic devices, marine and river vessels, heavyduty trucks, metal-working equipment, tractors and agricultural machines, and steam locomotives. Expansion of this form of cooperation has led to expansion of mutual shipments. From 1971 to 1977 shipments of machines, equipment, devices and means of transport increased from 1.3 billion to almost 6.3 billion rubles' worth.

Work being carried out in this field has had a significant influence on the mutual exchange of scientific and technical achievements, on successful fulfillment of joint projects for creation and assimilation of modern kinds of equipment. In recent years more than 1,600 new designs of machines, mechanisms and devices have been created by joint efforts. Thus, an important result of the cooperation of CEMA member countries is the creation of a Unified System of Computers (YES EVM) and organization of their production on the basis of specialization and cooperation.

The possibilities in the area of specialization of machine building production are quite extensive, but they are not yet fully utilized. Our common task henceforth is to develop in every possible way and intensify the economic and scientific and technical cooperation with organizations and enterprises of machine building industry in the CEMA member countries, to clearly fulfill our commitments, to raise the effectiveness of cooperation, and to work in this area with awareness of its future prospects. The 32d Session of the CEMA, held in 1978, approved a long-term target

program of cooperation in the field of machine building among other programs. Now the main problem consists in that the long-term program should be realized in a system of specific agreements and that the next five-year plan be a period of intensive productive and scientific and technical cooperation.

The role which machine building plays in solving the economic, scientific and technical, and social problems facing the national economy is increasing. The greater the responsibility and energy displayed by workers of the machine construction industry in realizing the assignments of the 10th Five-Year Plan, in discovering additional resources for increasing the efficiency of common production, and in improving the control and organization of production, the more fully utilized will be the intensive factors of production growth and the better will be the quality of all work.

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