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31 December 1979

USSR Report

INDUSTRIAL AFFAIRS

(FOUO 13/79)

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AUTOMOTIVE AND TRACTOR INDUSTRY

STATUS REPORT ON FIVE-YEAR PLAN AUTOMOTIVE TARGETS

Status at ZIL and GAZ

Alma-Ata AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA in Russian No 4, 1979 signed to press 12 Mar 79 pp 28-29

[First part of two-part article by Yu. Teplovodskiy: "On the Final Stretch of the Five-Year Plan"]

[Text] In the automotive industry work is continuously in progress aimed at more intensive development of this branch of industry. Its objective is to expand the variety of vehicles designed to satisfy the ever growing needs and requirements of our economy and personal transportation. The number of different models and modified versions being produced by the associations and enterprises of this branch on the final stretch of the 10th Five-Year Plan exceeds 300. This figure applies to models. More than 2 million cars and trucks will be produced this year alone. And the figure will be even higher by the end of 1980.

The Soviet Union is presently the world's third largest producer of trucks. Everybody is familiar with the plants which build them.

The most popular truck in this country is the ZIL-130. Approximately 3 million of these trucks have been built to date. The Moscow Automotive Plant imeni I. A. Likhachev is today the AvtoZIL Production Association, which consists of 13 specialized plants and has a work force of more than 100,000 skilled workers, engineers, technicians, and white-collar workers.

At the present time ZIL is the USSR's largest manufacturer of medium trucks. It produces for this nation's economy (in addition to the model designated above) the ZIL-131, -133, - 133G, and -157KD. The latter has replaced the ZIL-157K off-road vehicle with which we are all familiar. It has been in production only a comparatively short time (since June of last year), but production is growing every day.

The ZIL-157KD truck with off-road capability possesses substantial advantages over its predecessor. It features a more powerful engine, an alternator with voltage regulator, and transistorized ignition. It is more reliable in operation and, most important, more economical. It is unlikely that this model will undergo any design changes in the near future, but the base model (ZIL-130) and models with the identifying numbers 131 and 133 have been radically improved and, beginning with this year, are being delivered to the customer with a number of design changes, for the most part "hidden" changes. And it is quite possible that those who operate and maintain them have not yet discovered these changes. For example, the pistons contain four holes running through the piston body and elliptical skirts, which eliminates the possibility of jamming in the cylinders when minimum heat expansion gaps are maintained; a corrosion-resistant cast iron insert has been added in the area of the top piston ring. The connecting rod bearing securement assembly on the crank pin has been changed: the bolt-nut-locking pin set has been replaced with an increased-hardness bolt-washer-nut set.

There have been design changes in the water pump and engine cooling system; a triple-line tubular radiator such as on the ZIL-130 will be employed on the ZIL-131, and the K-88A carburator has been replaced by the new K88-AYe carburator, with the throttle chamber body and aluminum casting. A number of design changes have also occurred in other units and assemblies on ZIL trucks. In the final analysis they all pursue a single objective -- to make truck servicing and maintenance easier.

The engineers at ZIL are also focusing their attention on improving engine and truck fuel economy. Some of the designated measures have already been carried out, and as a result fuel and lubricant consumption to ignition loss is at the level of analogous foreign-made engines such as Ford, Leroi, International, and others.

In order to achieve further decrease in fuel consumption on the ZIL-130 truck, a fuel feed line with uniform mixture distribution to the cylinders will go into production this year; fuel consumption tolerances will be reduced in the manufacture of carburators; a high degree of precision of metering devices (jets) will be obtained by manufacturing them on special machines; trucks will come with radial tires with reduced unbalance and rolling resistance.

The following are to be added to the ZIL-130 by the beginning of 1980: an electronically-controlled forced-idle economizer, and an electronically-controlled variable ignition advance. A long-life multiple-viscosity oil will be used, as well as oil control piston rings with a dual-function expander, which will reduce oil consumption.

A further substantial decrease in fuel consumption on ZIL trucks will be achieved by changing over to premix chamber or diesel engines. Incidentally, the ZIL-130F precombustion chamber engine, based on the ZIL-130, has twice passed interministerial acceptance tests, which confirmed its excellent fuel economy and low level of exhaust gas pollution. This engine was recommended for production, and USSR Gosplan is considering putting it into series production.

A changeover from gasoline to diesel motors provides a fuel consumption decrease of 30%. To promote greater use of diesel power, plant engineers have designed, built and tested the ZIL-133GYa and ZIL-133 VYa three-axle truck tractors. They are powered by 210 horsepower KamAZ diesel engines. Set up as 17-18 ton tractor - trailer rigs, these truck tractors successfully passed interministerial acceptance tests, and they should soon go into production. This is a first important step toward diesel-powering the trucks built by this plant.

They have also designed and built experimental models of the ZIL-645 diesel. They are presently in the advanced stages of testing. These are 8.74 liter 185 horsepower V-8 engines.

It is assumed that the ZIL-645 diesel engine will power the ZIL-130 and ZIL-131 truck tractors, which are currently in production.

Putting into production ZIL-138D2 pressurized tank trucks and dump trucks and ZIL-138 V-1 truck tractors will help supply the economy with new, improved and more economical vehicles. Plans call for increasing the load capacity of the ZIL-133GI three-axle truck to 10 tons. Design, engineering and other services are currently refining the design and stepping up preparations to produce the new diesel-powered ZIL-139 truck. Tractor-trailer rigs of various designations with a load capacity of 12-14 tons can be based on this truck. Production startup on this model will constitute an important stage in the development of the entire association.

AvtoZIL also produces small numbers of deluxe ZIL-114 and -117 passenger cars. One of the latest models is the ZIL-117V (with convertible top).

The association supplies trucks to 50 different countries.

The Twice Order of Lenin, Order of the Red Banner, Order of the Patriotic War, 1st Class, Gor'kiy Automotive Plant (GAZ Production Association) exports its products to a somewhat smaller number of countries (32). This is one of the country's largest and leading enterprises in the manufacture of 2, 2.5 and 5 ton trucks, as well as the Volga and Chayka passenger cars.

The Gor'kiy automotive engineers are constantly improving their product. For example, in 1970 the GAZ-52 and GAZ-53 trucks ran 120,000 meters before major overhaul, while by the end of the current five-year plan this will be boosted to 250,000. Truck payload will also be substantially greater.

...Various vehicles are being tested in the road testing laboratory of the plant's experimental design division. One of these vehicles is the modernized GAZ-53. What design changes have been made? First of all, it is powered by an improved motor built at the Zavolzh'ye Motor Plant, which has increased mileage to major overhaul by 25%. Fuel consumption is 4-5% lower than before, and the pollution level of the exhaust gases has been significantly reduced.

Thirdly, the hinged steering column and brake system separate lines increase operating reliability and safety. Third, Mileage to TO-1 [Maintenance Inspection-1] is to be increased from 2,500 to 3,500 kilometers.

Difficulty of servicing and maintenance has been reduced 20%. And fourth, the interior has been made more comfortable.

There is one more important improvement. Working jointly with USSR Goskomsel'khoztekhnika, the plant's engineers have developed accessory equipment -- mount-on boxbed sides, seals, tiedowns, and a canvas cover. This cargo bed sealing capability totally eliminates loss of grain during hauling.

Changes have also been made in the design of the GAZ-66 truck. In particular, the front bumper has been extended, and the fold-back and removable sections on the cab provide ease of access for maintenance and repairs. This model will soon be equipped with separate brake systems and transmission located closer to the driver -- this will improve vehicle operation and control.

What does the future hold? An improved model of the GAZ-66-06 truck has been designed. The production startup papers have been issued, and production preparations are already in progress. A new truck, the GAZ-4301, is currently in the design process. This truck will reflect the latest achievements of Soviet and foreign automotive engineering. An air-cooled diesel motor will cut almost in half specific fuel consumption per ton of payload. Hooking a trailer to this truck will more than double load capacity -- to 9 tons, and mileage to major overhaul will be extended to 300,000 kilometers.

Now a few words about the association's passenger cars, and in particular the Volga family of cars, since our magazine has already discussed the Chayka (GAZ-14) in detail (see No 11, 1978).

The Gor'kiy Plant has been building the GAZ-24 since 1970. During this period more than 200 changes have been made in this car, increasing its reliability and durability, driving safety, and making servicing and maintenance easier. This model presently meets the requirements of 26 out of 27 existing international regulations. Its service life has increased from 300,000 to 350,000 kilometers, and this new figure has been added to the car's specifications. Labor requirements of servicing and maintenance have been reduced 22%. Work is continuing on further increasing the body's resistance to corrosion, to reduce interior noise and to reduce exhaust pollution. Plans call for producing a model fueled by bottled gas. The plant has begun preparations for building a new GAZ-3102 model, which will replace the GAZ-24 in the coming five-year plan (at approximately the end of 1981). Experimental models of the new Volga are presently undergoing testing. We can add the following to information which is already available on the GAZ-3102 (ATK, No 1, 1979): the hood, fenders, grill and front bumper will be somewhat restyled. The go-ahead has been given for employment of a precombustion-chamber motor, more rugged front suspension, and antihydroplaning tires; the spare tire will be located under rather than in the trunk. The fuel tank will be positioned in a safe location, behind the rear seat. Performance will also improve. The new Volga will accelerate to 100 km/h in 18 seconds, while the GAZ-24 requires 24 seconds. Top speed will be 155 km/h.

In addition to the GAZ-3102, engineers are readying for production the GAZ-31011, a model offering greater comfort and an eight-cylinder motor. It will go into production immediately following the GAZ-3102 Volga.

Status At Other Automotive Plants

Alma-Ata AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA in Russian No 5, 1979 signed to press 9 Apr 79 pp 28-29

[Second part of two-part article by Yu. Teplovodskiy: "On the Final Stretch of the Five-Year Plan"]

[Text] The workers at the Belorussian Heavy Truck Association imeni 60th Anniversary of the Great October Revolution are approaching the home stretch of the 10th Five-Year Plan with outstanding success in building modern trucks and trailers. BelavtoMAZ is Europe's largest supplier of tractor-trailer rigs, dump trucks, off-road trucks, tractors, and scrapers. The association's plants build 32 different trucks ranging in size from 8 to 120 tons, plus 13 models of trailers and semitrailers.

Manufacture of a large variety of heavy trucks at BelavtoMAZ became possible due to a high level of standardization and utilization of the method of designing with standardized parts and assemblies. The level of standardization of trucks of the MAZ-500A family to the MAZ-500 base model is 87.3%.

We should mention that all series-produced trucks at the Minsk Automotive Plant bear the State Seal of Quality.

One of the most important items on which modernization of MAZ trucks is grounded is improvement in truck mileage to the first major overhaul to 300-320 thousand kilometers by the end of this five-year plan. A number of measures are being taken to achieve this figure. Thanks to unique design solutions, for example, durability of the frame on the new MAZ trucks has been increased by 100 to 150%. This was achieved by eliminating holes in the horizontal flanges of the side members and attachment to the vertical wall of side members of such structural elements as the front bed support, fuel feed linkage, spare wheel holder, radiator and muffler brackets, and forward engine mount. Also adopted was a new-design leaf spring mount, which has increased spring life severalfold. To extend the life of the exhaust system, the exhaust piping has been rerouted, eliminating various bends. Stronger fuel tank and battery mounts are also being employed.

Considerable work has been done to improve driveshaft design. Tests have shown that as a result of this, universal joint life has increased by double or triple.

Improvement in the quality of trucks produced would be impossible without increasing the safety of the design, which has been achieved by equipping trucks with separate brake systems, increasing the capacity of compressed-air tanks, adding an oil-and-moisture trap, employing asymmetrical beam headlights, plus other refinements.

In working on improving the performance of new MAZ trucks, the designers do not ignore the problem of making them more comfortable and easier on the driver. Toward this end they are reducing vibrations at the driver's seat, planning utilization of a new seat with improved shock-absorbing capability, installation of a higher-output cab heater, and improved cab interior.

In addition to the truck, trailers on the MAZ-8925 chassis and a number of semitrailers are also undergoing qualitative changes.

In the fourth year of the five-year plan the Minsk truck builders will complete acceptance tests on and build an experimental batch of MAZ-7516 multi-axle fully power-assisted dump trucks with excellent off-road performance and a 20-ton load capacity for service in Siberia and the Far East. The Zhodino builders of giant trucks will produce experimental models and conduct tests on 110-ton BelAZ-7519 dump trucks.

Another and equally important task facing the designers at the Belorussian Automotive Plant is to design a 180-ton dump truck. It will feature an advanced electric transmission. Trucks of this size will naturally need new 2,000-2,300 horsepower engines. And the designers are currently studying the possibility of employing gas-turbine engines in these trucks.

Another enterprise of BelavtoMAZ -- the Mogilev Automotive Plant -- will also be supplying the nation's economy with new equipment. A series of off-road 20-ton dump trucks, model MoAZ-522A, designed for operations in areas where no roads are available, will go into production this year.

Latest developments at the Kremenchug Order of Lenin Automotive Plant imeni 50th anniversary of the Soviet Ukraine -- lead enterprise of AvtoKrAZ -- include the new model KrAZ-6435-8570 tractor-trailer rig. At the end of last year two experimental models were operationally tested at Automotive Combine No 28 of Mosstroytrans, under the observation of people from the automotive plant and the Central Scientific Research Institute of Motor Vehicles and Automotive Engines. Just as all its predecessors, it is powerful, highly reliable and durable, and can operate off roads. It bears little resemblance to them externally, and in design it is far superior to the well-known KrAZ-256B. It is powered by a 300-horsepower turbocharged diesel engine from the Yaroslavl' Motor Plant. Most of the principal components have been redesigned, as has the mode of wheel attachment. The load capacity of the new KrAZ is 3 tons greater than the KrAZ-256B. It features easy steering. Body and trailer can be controlled from the cab -- an important item in the performance features of this new model.

Ural trucks with excellent off-road capability have recently won the hearts of truck drivers. These off-road-capability vehicles can be encountered in various parts of the Soviet Union and abroad. They are to be found wherever roads are sparse, where the terrain is rugged and roadless, and where other trucks cannot travel.

They are produced by the work force at the Urals Order of the Red Banner of Labor Automotive Plant (lead enterprise of the Urals Truck Production Association).

The Urals plant recently built test models of a new Ural-432001 heavy-payload truck. It also has good off-road capability. It is designed to operate under the harsh conditions of the Far North. The load capacity of the new Ural is 5 tons, and it will tow a trailer grossing 11.5 tons. The trailer carries a payload of 8 tons.

The cab offers very convenient features to the driver. It carries off-road rubber produced by the Omsk Tire Plant; these tires are designed to operate at temperatures down to 60° below zero. Two test models are presently undergoing off-road testing in the snowy wastes of the Yakut ASSR.

A most important measure aimed at meeting the requirements of the nation's economy is a planned, scheduled increase in the manufacture of KamAZ tractor-trailer rigs. Three models of a large family of KamAZ truck tractors have been in production since 1978. This year the truck builders in Naberezhnyye Chelny have begun assembling the first commercial batch of trucks of the new KamAZ-53212 model. Based on the existing KamAZ-5320 8-ton truck, the new truck, in contrast to its predecessor, carries a payload of 10 tons. The cab contains a bunk space for the driver. The driver's work station is now larger and more comfortable. The truck body is also longer than the KamAZ-5320.

The designers took pains to ensure that the plant workers could put the new model into production as quickly as possible. Standardization of basic assemblies and components with the KamAZ-5320 amounts to 93%.

In addition to boxbed 10-ton trucks, special trucks will be built for municipal services, road and construction work.

Here is another new development; a complex series of factory tests on the KamAZ-54112 truck tractor is nearing completion. This vehicle is designed to operate as an overland tractor-trailer rig with a load capacity of 20 tons. The design of this vehicle incorporates a number of changes. It is more efficiently laid out. In particular, the items we now see behind the cab of the current model -- air cleaner, tool box, spare wheel -- will be "concealed" on the frame....

Kama tractor-trailer rigs will be operating in various climatic conditions. Association designers have completed development of experimental models designed to operate under conditions of temperatures ranging from +40 to -60°. Arctic version KamAZ-E541001 truck tractors have returned from experimental service on hauls in the permafrost zone. The Arctic version of this truck tractor contains additional features for driver convenience.

The Kama truck builders have set for themselves the task of providing the nation with improved-payload trucks with better off-road capability, trucks which are reliable and long-lived.

Base models of buses will also be modernized. The PAZ-672, for example, will be replaced by a new, improved model, prototype units of which have passed government tests and fully meet the demands made on urban transit buses, that is, reduced stepup, wider door openings, etc.

The L'vov Bus Plant imeni 50th Anniversary of the USSR has begun putting a new model into production -- the LAZ-4202 medium urban transit bus, which is distinguished by excellent comfort and dynamic qualities. It is equipped with items which make the driver's job easier: automatic transmission, and power steering. It is powered by a KamAZ diesel. The Likinsk Bus Plant has begun developing a model also to be powered by a KamAZ diesel engine. Plans call for standardizing the new bus with a future standardized family of buses.

There will also be improvement in models built by VAZ, Kommunar, the Ul'yanovsk Automotive Plant, RAF and AZLK. In addition to improvement of current models, new models will be developed. Recently the first units of the Moskvich-21406 model came off the assembly line at the Automotive Plant imeni Lenin Komsomol. They boast improved off-road capability and are powered by a downrated motor burning 76 octane gasoline. Completion is scheduled on the engineering documentation for another new model -- the Moskvich 2141. This model will utilize several newly-designed assemblies.

The automotive workers of Tol'yatti are about to bring out more modern, convenient and reliable models. Experimental models of an amphibious vehicle, based on the Niva, are undergoing testing. And the VAZ-2108 Zhiguli, which is presently on the drawing boards, is called by the Volga automotive workers the car of the 11th Five-Year Plan. In contrast to previous models, it will have front-wheel drive.

3024
CSO: 1821

AUTOMOTIVE AND TRACTOR INDUSTRY

NEW PASSENGER CAR MODELS DESCRIBED

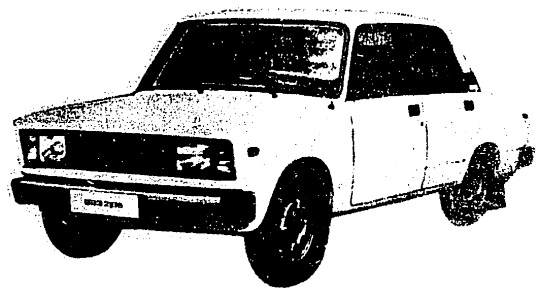
Alma-Ata AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA in Russian No 8, 1979 p 44

/Editorial staff response to letters: "A Competent Companion"/

> /Text/ The March issue of AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA carried photographs of new models of domestic automobiles and a brief description of them in the "New Equipment" section. One of them--the VAZ-2105 --was of considerable interest to us, the owners of "Zhigulis." Couldn't the editorial staff provide more detail on the new product of the Volga Motor Vehicle Plant?
>
> These lines were taken from the letter from Karaganda automobile enthusiasts Yu. I. Kuraksin, an engineer, and N. A. Gomzyakov, an electrician. A similar question was put to the editorial staff by Kustanay resident V. G. Slobodin, V. I. Kravchenko from Semipalatinsk, and a group of automobile enthusiasts from Aktyubinsk.

"In more detail"... It is difficult to answer this question posed by our readers. The fact is that the new automobile from the Volga plant has so far been displayed as experimental models; work on it is still being conducted and it is too early to speak about all the refinements. We can add the following to the data provided previously:

The VAZ-2105 is a comfortable, small-displacement car which seats five. Roads with any surface, except dirt with deep ruts, are all right for it. It was designed for operation in outside air temperatures from 45 above to 40 below zero degrees Celsius. The advanced design of the engine, with the use of high-grade lubricants, ensures its reliable startup at a temperature of minus 25 degrees Celsius without a starting preheater. A toothed belt in the drive of the valve-timing gear and the "Ozon-2" carburetor with additional systems have made it possible to reduce engine noise and the toxicity of exhaust gases, and to increase its economy at the same time.



APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200030053-8

A separate brake system, a pressure regulator in the rear brake system, and automatic adjustment of clearances between the shoes, discs and drums meet current requirements for safety set forth for the design of a passenger automobile.

The light suspension of the automobile, the modern interior, and the nearly noiseless operation of the engine create an important impression when traveling in the automobile and significantly reduce driver fatigue.

The new "Zhigulis" have better performance than the VAZ-21011, their predecessor; they are more reliable and have a longer useful life, but all this, in the final analysis, will depend on observance of operating rules and their maintenance.

The VAZ-2104 will be produced at the same time as this model. Its basic distinction from the VAZ-2105 is its reinforced rear suspension and a multi-purpose /"universal"/ body.

The Volga plant workers are constantly improving the design of their models and are turning out new ones, one of which is the VAZ-2107. Test models of it also came off the plant's assembly line at the end of last year. And it is possible that precisely this model, and not the VAZ-2105, will be put into series production initially.

The VAZ-2107 automobile (lower photo) was made on the basis of the 2106 model. It is characterized by the absence of moldings and the "square" shape of the body; the radiator frame has been moved forward slightly, and because of this it somewhat resembles the Mercedes automobiles of the Daimler-Benz firm. The square headlights have been equipped with wipers. Just as in the VAZ-2105, the most advanced materials have been used in the interior finishing of these "Zhigulis."

8936
CSO: 1821

AUTOMOTIVE AND TRACTOR INDUSTRY

POWDER-METALLURGY FACILITIES FOR TRUCK REPAIR SHOPS URGED

Alma-Ata AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA in Russian No 10, 1979 signed to press 17 Sep 79 pp 22, 23

[Article by B. Tikhonov, candidate of engineering sciences and chief of the machinebuilding sector of KazNIINTI [Scientific-Research Institute for Scientific and Technical Information and Technical and Economic Research: "Automotive Repair Operation Needs Powder Metallurgy"]

[Text] It has been estimated that as a result of converting 1,000 tons of articles from ferrous metals to manufacture by powder metallurgy technology, the economic effect is 1.3 million rubles, and in the case of conversion from nonferrous metallurgy, more than 2 million rubles. Metal savings in this case are 1,500-2,000 tons.

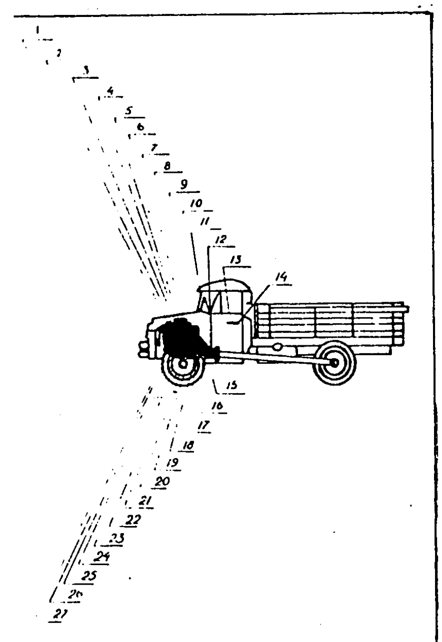
The automotive industry is in first place among customers for powder metallurgy output. In order to manufacture one domestically produced truck, the following amounts of special articles are used: for a ZIL 2.31 kg, a MAZ 2.81 kg, a LAZ 3.64 kg, a BelAZ 13.16 kg and a GAZ 3.7 kg. There are 65-70 such articlcs of 28-30 types (depending upon the model) in each motor vehicle produced by the Volga Motor-Vehicle Plant. Their total weight in Zhigulis average 1.2 kg, in the design of the Kama Association's trucks--4.4 kg (51 parts of 19 types).

More than 130 specified parts (structural, antifriction and filtering) are being manufactured by powder metallurgy at 11 specialized plants or sections for all models of domestic motor vehicles. The largest enterprise of the industry is the Moscow Powder-Metallurgy Plant, which produces them (5,000 tons per year) for the ZIL-130 truck (figure 1) and the Moskvich-412.

The AvtoVAZ [Automotive Production Association of the Volga Motor-Vehicle Plant] system has two powder-metallurgy departments (in Tol'yatti and Dimitrovgrad). These departments, the largest in Europe, are equipped with the most advanced technology. Parts that are manufactured here are also installed on motor vehicles made by GAZ [Gor'kiy Motor-Vehicle Plant], KamAZ [Kama Motor-Vehicle Plant], ZIL [Moscow Motor-Vehicle Plant imeni I. A. Likhachev], ZAZ [Zaporozh'ye Motor-Vehicle Plant imeni Kommunar], AZLK [Moscow Motor-Vehicle Plant imeni Leninskiy Komsomol] and UAZ [Ul'yanovsk

Motor-Vehicle Plant imeni V. I. Lenin. They raise the reliability of many components. For example, when the shock absorbers of the GAZ-24 truck began to be outfitted with articles of this type, their quality rose sharply. However, the requirement for such parts for the GAZ truck is 25-30 kg, that is, 7-fold to 8-fold the amount now being used.

[Figure 1]



Key:
1. Water pump gasket washer.
2. Drive shaft sleeve.
3. Rotor sleeve.
4. Drive housing.
5. Compression valve housing.
6. Valve guides.
7. Rings for valve surfacing.
8. Floating washer.
9. Oil pump gear.
10. Synchronizer V-rings.
11. Windshield-wiper motor housing.
12. Door-hinge housing.
13. Window-raising gear.
14. Lock rotor.
15. Distributor shaft thrust washer.
16. Clutch release shaft sleeve.
17. Propeller shaft sleeve.
18. Clutch pedal sleeve.
19. Pitman-arm draglink block.
20. Centrifuge axis thrust washer.
21. Cylinder-head bushing.
22. Tie rod block.
23. Shock-absorber piston rod.
24. Thrust washer for front-axle housing.
25. Shock-absorber piston.
26. Rod sleeve.
27. Knuckle bearing thrust washer.

The increased durability of powder-metallurgy articles yields great economic effectiveness not only in motor-vehicle manufacture but also in the sphere of motor-vehicle fleet operation. Thus it is now necessary to solve the problem of providing spare parts made of powder materials to motor-vehicle repair enterprises, motor pools, motor-vehicle technical-service stations, and the owners of personal transport throughout the Kazakh SSR. All the potential for this exists.

First of all, the spare-parts mix and the republic's requirements for articles of this type in the next few years should be determined. The economic benefit will be evident from this, and it will become possible to plan with precision the development of powder metallurgy in the Ministry of Automotive Transport's sphere. It is necessary to organize a powder-metallurgy department (or section) at one of the automotive-repair enterprises for the large-scale manufacture of various sintered parts for the engines and underframe of motor vehicles and also for some automotive instruments.

For purposes of orientation, table 1 shows the composition of the equipment of a powder-metallurgy section with a productivity of 250,000 parts per year (based on iron and copper powders) which are to execute two processes (cold compacting and dynamic hot compacting). This section occupies an area of 430 square meters and calls for two-shift operation. Its staff consists of 41 people. Capital costs for the equipment and the construction and installing work does not exceed 330,000 rubles.

Adequately precise observance of regimes for powder-metallurgy technology during all operations is required in order to obtain high-quality products. Therefore, equipment that meets definite requirements is necessary. Double-cone powder blenders with electric drive, whose local fabrication can be organized easily, are used most often for nonstandard (preparatory) equipment.

Standard hydraulic presses manufactured by the Orenburg Plant for Hydraulic Presses, mechanical presses of the Saran' Forging and Pressworking Equipment Plant and automatic presses produced by the Ryazan' Forging and Pressworking Equipment Plant can be used to compact the powders. Imported presses of various types manufactured by the Dorse and Manesman [transliterated] companies (FRG), Gidraum (GDR) and Billaud (France) can be used.

Sintering and thermal treatment are performed in furnaces that differ in heating principle (resistance and induction furnaces), according to the nature of the charge (batches and continuous-action) and the medium (for operation with protective atmospheres and rarefied atmospheres). These furnaces are delivered in a complete set, ready for connection to the electric-power network. The series manufacture of electric furnaces has been organized at the Moscow Plant for High-Frequency Furnaces (MEVZ) and some other domestic enterprises and also at the Degussa company of the FRG.

Many automotive spare parts for structural purposes can be manufactured from iron powder by a simple method--by sintering pressed cold compacts. In order to obtain high-strength parts (levers, cams, rocker arms, couplings, oil-pump gears, and so on) the method of hot pressing of compacts after they have been cold molded should be used. Here there is no separate sintering operation and, with a view to cutting the costs of the starting material, steel and cast-iron shavings can be added to the blend.

The essence of the technological process of obtaining high-strength articles is evident from figure 2. First, the molded cold compact made of iron powder is preheated in a die, and it is compacted in a steel (still better, in a hard-alloy) die, whose preheating does not exceed 150 degrees C. Therefore, the durability even of a steel die consists of several thousand parts where the article is extracted from it with ease.

Thanks to the simple process, the lack of furnaces with a monitored atmosphere, eccentric crank presses and standard-model TVCh [high-frequency

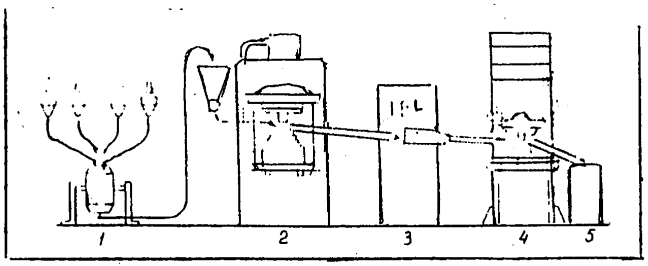
Table 1

Basic Equipment of a Powder Metallurgy Section with a Productivity of 250 Tons Per Year

Equipment designation	Model	No.	Total output, tons/year	Total cost, thousands of rubles	Application
Press, hydraulic, 250 tons-force....	DA 1534	1	40	30.0	For large parts
Press, hydraulic, 400 tons-force....	DA 1536	1	70	37.8	For small parts
Press, automatic, mechanical, 60 tons-force......................	KAO 628	1	63	26.1	
Press, automatic, mechanical, 100 tons-force......................	K 8130	1	60	39.5	
Press, automatic, mechanical, 160 tons-force......................	KO 632	1	55	50.0	
Press, mechanical, 400 tons-force...	K 9536	1	60	27.7	For dynamic hot pressing
Press, mechanical, 250 tons-force...	KA 2534	1	75	31.0	For dynamic hot pressing
Press, precision-forging, 100 tons-force..........................	KO 430	1	30	4.5	For sizing parts
Electric furnace, resistance........	STN-2.5. 20.1/15-M2	2	336	31.0	For sintering compacts
Electric furnace, compartment-type..	G-50	1	15	0.98	
Installation for dissociating ammonia..........................	–	1	–	5.0	
Installation, TVCh [high-frequency current], 100-kw..................	–	2	–	3.0	
Blender, double-cone................	–	3	348	2.1	Nonstandard equipment
Blender, "drunken barrel"...........	–	2	20	–	
Bath, quenching.....................	–	2	–		
Other equipment (cooler, cabinets, work tables, rack stands).........	–	16	–	5.0	
Total..				293.68	

currents] installations, organizing the production of automotive spare parts by this method does not present difficulties for any automotive repair enterprise.

[Figure 2]



Key:
I. Iron powder 99.1-98.8 percent.
II. Lamp black 0.5-0.8 percent.
III. Pencil lead 0.2 percent.
IV. Zinc stearate 0.5 percent.

1. Mixing the blend.
2. Cold compacting P = 5 tons-force/square centimeter.
3. Heating with TVCh [high-frequency current] to 1,150-1,200 degrees C.
4. Hot compacting P = 8-12 tons-force/square centimeter.
5. Cooling.

The TsKTB [Central Industrial-Design Office] of the branch can be charged with developing the industrial tooling, suitable materials and design for the parts (spare parts) and the experimental operations. Economically effective cooperation with other organizations also is possible.

11409
CSO: 1821

AUTOMOTIVE AND TRACTOR INDUSTRY

CHITA PLANT PRODUCING ZIL-130S TRUCKS FOR USE IN FAR NORTH

Alma-Ata AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA in Russian No 10, 1979 p 26

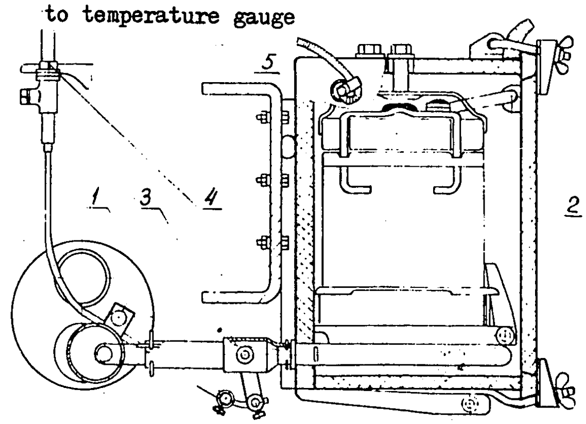
/Article by B. V. Lapshinov, acting chief of the chief designer's department at the Chita Motor Vehicle Assembly Plant: "Vehicle for the North"/

/Text/ The "Basic Directions of USSR National Economic Development in 1976-1980" state: "Ensure the development and expanded production of equipment and materials meeting the demands of operation in the different climatic zones of the country, and especially in the Far North." In actualizing this decision, vehicle builders of our country have begun producing vehicles for the north. Thus, Minsk workers are already supplying BAM /Baykal-Amur Trunk Line/ builders with new 38-ton trailer trucks. These powerful vehicles, with their two diesel motors, are called "die-hards," after the bison which live in the dense Belovezhskaya forest. The first all-terrain "Ambulance" vehicles, produced by the Ul'yanovsk Motor Vehicle Plant, have also been sent here. Several models produced by the Kama association for the production of heavy-duty vehicles have been modified for use in the north. A large lot has been tested in Yakutiya and in northern Chitinskaya Oblast. Also in Chita is a branch of the Moscow Motor Vehicle Plant imeni Likhachev. It recently began producing ZIL-130S trucks, a so-called northern modification. We will touch on this model in more detail, inasmuch as the "S"-suffix ZIL's /"S" indicating "northern"/ have supplemented the vehicle fleets of several branch enterprises located in the northern regions of the republic. It is discussed by B. V. Lapshinov, acting chief of the chief engineer's department at the Chita Motor Vehicle Assembly Plant.

The ZIL-130S is intended to perform the same functions as the base model, but under the road conditions of the Far North, with air temperatures of -60°C, so the cab is more tightly sealed. It has polyurethane foam insulation applied in a 12-15 mm layer throughout the interior surface of the cab.

All the cab glass, including the windshield, is double-pane, the space between the panes being poured full of granules which absorb moisture. The door spaces have additional packing around the edges: leather substitutes with a thermal insulation layer. The hand brake is equipped with a packing cover which keeps dust and cold air from entering the cab.

The battery compartment, heated by engine exhaust gases, is also well-insulated. This is done as follows (see drawing): exhaust gases move from the left exhaust pipe through a connecting pipe (1) and receiving fitting to the heating pipe (2), which they heat and which in turn heats the air in the compartment to a temperature regulated by a plate installed in the receiving fitting (3). Its position is changed by turning a handle (4) on the top of the transmission access cover to the right of the driver's seat.



When the plate is wide open, the current-source compartment is heated very intensively, and the driver must keep track of this by watching the temperature gauge on the cab dash. The temperature pick-up itself (5) is mounted on the front of the battery case.

The battery heating system is switched on only in the winter, when the temperature reaches -20°C. The air in the housing is heated to +40°C, since the mastic on the battery melts at higher temperatures. In the summer, the top of the case must be opened when the temperature exceeds +30°C and the plate is closed.

At customer request, a winch to pull the vehicle out of trouble is installed on the ZIL-130S. It has a maximum tractive force of 5,000 kg-force and a maximum cable length of 65 meters. Among the other equipment installed on the northern-modification ZIL are fog lights (attached inside the front bumper opposite a special cut-out) and a pivoting searchlight.

The vehicle is equipped with additional entrenching equipment: shovel, ax, cross-cut saw, cable, winch (block and tackle) to increase traction force or to change traction direction. This "northerner" is equipped with an additional 170-liter fuel tank (it previously had a 60-liter tank) situated where the spare wheel is secured, and the "spare" is put in a holder attached to the frame at the rear of the vehicle.

11052
CSO: 1821

CONSTRUCTION, CONSTRUCTION MACHINERY, AND BUILDING MATERIALS

TECHNICAL PROGRESS IN THE CONSTRUCTION INDUSTRY

Moscow VOPROSY EKONOMIKI in Russian No 8, Aug 79 pp 118-128

[Article by V. Tolpygin; continues discussion begun in VOPROSY EKONOMIKI No 7 by Academician T. Khachaturov in article "Ways of Improving the Effectiveness of Capital Investments"]

[Text] The USSR has a powerful construction industry capable of accomplishing large and complex tasks. The construction of large enterprises and installations is generally carried out on schedule using advanced processes and with high-quality construction and installation work. At the same time, many enterprises are giving in to delays and breaches of schedule norms. The average duration of construction of production facilities is 1.8 times the norm. The annual shortfall in introduction of capacities is reaching 35-40 percent. Of these cases, 85 percent of enterprises and installations are finished behind schedule through the fault of the builders and 15 percent through the fault of the purchasers, primarily because of late provision of equipment and planning and estimate documents.

An industrial base has been developed for dwelling construction, which now uses standard plans, but the actual duration of construction in 1977 was half again as high as the standard. The norms for duration of construction are observed only in the first year, and even in this year the builders are performing no more than half of the prescribed quantity of work. In the following plan year, the specified annual quantities of capital investment in construction and installation work are reviewed by purchasers and contractors.

Immense resources are being put into the construction industry (35 billion rubles in the Ninth and Tenth five-year plans). During the Ninth Five-Year Plan, about 18.2 billion rubles was allocated for development of the production base for construction, 3.4 billion rubles or 19 percent more than called for in the five-year plan. Fixed production capital of contracting organizations increased by 89 percent, while the quantity of contracting work increased by only 40 percent. In the Tenth Five-Year Plan 17.4 billion rubles was allocated for the construction industry. In 1976-1977, capital investments worth 9.6 billion rubles were utilized.

Nonetheless, the level of industrialization of construction work and the scale and capabilities of the material and technical base still do not meet current requirements and are not making possible accomplishment of the tasks assigned by the 25th Party Congress and the November 1978 plenum of the CPSU Central Committee as regards capital construction.

The technical and economic performance indicators of the work of construction organizations (particularly in the main general construction ministries) remain unsatisfactory. In the Tenth Five-Year Plan, owing to systematic nonfulfillment of plans, the increase in construction work in these ministries essentially ceased. In the USSR Ministry of Heavy Construction [Mintyazhstroy], for example, the amount of construction and installation work performed with its own manpower increased by 31.4 percent from 1970 to 1975, with an average annual rate of increase of 5.6 percent, while in 1976-1977 the increase was 0.1 percent. The same rate of increase for these two years was realized by the USSR Ministry of Construction, while during the Ninth Five-Year Plan the rate of growth was 5.3 percent and the growth over 5 years was 29.3 percent.

In the USSR Ministry of Industrial Construction [Minpromstroy], the quantity of construction and installation work in 1975 was 29.6 percent higher than in 1970, giving an average annual growth rate of 5.3 percent. In 1978 this ministry did work at the same level as 1977. A decrease in the quantity of construction and installation work in 22 territorial construction administrations began in 1975, and accordingly the amount of work done by them in 1977 was 6-31 percent lower than in 1974.

The construction industry has not achieved the planned growth of labor productivity. In Mintyazhstroy USSR and Minpromstroy USSR the increase of labor productivity in 1977 was 0.3 percent, while in 1975 it was 5.2 percent and 4.6 percent respectively; in the USSR Ministry of Construction it was 1.9 percent in 1977, compared with 5.3 percent in 1975. We should note here that in the Tenth Five-Year Plan an increase in labor productivity of 2.3 points over the level achieved in the Ninth Five-Year Plan is called for.

It is clear that while the percentage of mechanized work increased with a concomitant decrease in manual labor and the percentage of construction materials and structural members of higher cost increased, construction ministries find it relatively easy to meet their plan assignments for increased labor productivity. According to data from a simultaneous calculation by the USSR Central Statistical Administration for 1 August 1975, of 5.5 million workers employed in construction and installation work and ancillary activities, 2.8 million or 50.2 percent were engaged in manual labor. Particularly large was the percentage of manual labor among plasterers, masons, painters and carpenters. Of 1,428 thousand builders in the above trades, 1,031 thousand, or 72.3 percent, were doing manual work in that year.

The reason for this circumstance is primarily that in construction the inadequate development of small mechanical tools, the requirement for which is only 25-30 percent satisfied, is a bottleneck. The industrial output of many types of small mechanical tools required by construction has not yet been organized, and construction organizations have been forced to manufacture them in limited quantities by a semi-workshop method.

However, labor productivity has failed to increase not only for workers engaged in manual labor but also for those performing mechanized labor, since the average daily work time for machines in 1977 was practically at the 1975 level. Output of machines and mechanisms in natural [nonmonetary] terms is increasing only slightly, which indicates inadequate attention to the development and incorporation in practice of better construction procedures which have already been developed.

At the same time, the plan calls for attaining the entire increase in amount of construction and installation work through an increase in labor productivity. With a planned increase in labor productivity amounting to 33.3 percent, every fourth worker will be freed up, which is extremely important given the scarcity of labor resources, and the three remaining workers will be doing the work of four. But such an increase in labor productivity has been achieved by none of the general construction ministries. As a rule, construction projects completed on time have had an above-plan number of workers. The other projects did not have the planned number, which has been the main cause of nonfulfillment of the plan for commissioning of productive capacities and of behind-schedule completion of the completion of non-production facilities.

The main construction materials remain the traditional ones: concrete, reinforced concrete and brick.

Beginning in 1950 and down to the present, precast reinforced concrete has undergone the greatest development. Between 1950 and 1965 the output of in-situ reinforced concrete increased by 25.5 million cuble meters and that of precast reinforced concrete by 54.9 million cubic meters, or more than double the in-situ figure. Between 1965 and 1977 the absolute growth of in-situ reinforced concrete production decreased to 18.8 million cubic meters, while the growth of precast reinforced concrete production increased to 64.9 million cubic meters, or 3.8 times the figure for in-situ concrete.

The increase in output of piece wall materials between 1950 and 1965 was 89 million cubic meters and that for 1965-1977 was 39 million cubic meters, a decrease of half, while the decrease in building brick was two-thirds (from 65.5 to 22 million cubic meters). Here the maximum increase in brick production (65.5 million cubic meters) was achieved in 1951-1955, while in the subsequent 10 years it remained level, beginning to increase again only in 1965. Since 1975 the production of brick has decreased from year to year.

The mass use of precast reinforced concrete items begin in the 50's in the USSR. At thattime brick production was at a very low technical level and labor productivity in brick plants was about 50,000 pieces per man-year, which was equivalent to 1.5 cubic meters of laid brick. Low labor productivity also occurred in reinforced concrete plants (80 cubic meters per man-year), but because the thickness of the panels was a third that of brick walls, labor expenditures for the

Production of Reinforced Concrete, Concrete and Wall Materials

	Measurement Unit	1950	1965	1977	1977/1950
1. Reinforced concrete	million cubic meters	12.9	93.3	177.0	13.7X
Precast	"	1.2	56.1	121	
Increase	"		54.9	64.9	
"	Times		3.2	1.5	4.8
2. Wall materials (building brick, artificial and natural stone)	Billion pieces of standard brick	11.2	46.6	61.9	
Increase	"		35.4	15.3	
"	Times		4.2	1.35	5.5
Wall materials	Million m^3	28	117	155	
Increase	"		89	38	
Building brick	Billion pieces of standard brick brick	10.2	36.6	45.4	
Increase	"		26.2	8.8	
"	Times		3.7	1.24	4.4
Building brick	Million m^3	25.5	91	113	
Increase	"		65.5	22.0	
3. Slab concrete	Million m^3			102	

production of 1 square meter of wall panel were less than for the manufacture of the brick required for 1 square meter of wall.

On the construction site, labor productivity in the installation of reinforced concrete products was also higher in natural terms than for the bricklayers. Accordingly the switch to precast reinforced concrete at the time led to an increase in labor productivity not only in the construction industry enterprises but also on site and thus was unquestionably a great shift in construction technology which made possible a sharp increase in the quantity of construction work.

The situation in the 70's is different. The provision of automated euqipment for brick production in a number of plants made it possible to increase brick output per worker to 500,000-800,000 pieces a year, or by a factor of more than 10 10. Now one automated equipment operator produces every year the bricks required for manufacture of 1,250-2,000 cubic meters of laid brick, while the reinforced concrete products plants have a labor productivity in the range of 130-300 cubic mters. For 1977 it averaged 187 cubic meters or 0.7 cubic meters per shift.

It should also be borne in mind that in the 50's reinforced concrete wall panels were three-layered with fibrolite or other fillers, and their thickness was no more than 20 centimeters. Currently outer wall panels are mostly single-layered with keramzit gravel and their thickness for the middle zone of the USSR is 40 centimeters, as a result of which concrete consumption per square meter of wall has doubled, while for buildings as a whole it has increased from 0.6 to 0.9 cubic meters per square meter of useful area, i.e. by half (in the northern regions the thickness of keramzit-concrete panels is 60 centimeters). This circumstance has significantly changed the relationship of the total labor expenditures in bricklaying and the installation of keramzit-concrete panels.

As an example, let us consider data from the RSFSR Ministry of Agricultural Construction[1]. The actual annual output of bricklayers in natural terms for the RSFSR Ministry of Agricultural Construction in 1977 was 1.25 cubic meters and that for a worker engaged in installation of reinforced concrete members was 2.76 cubic meters. On this ground the conclusion is drawn that a rapid changeover must be made from brick to wall panels; labor expenditures on manufacture of brick and panels and the consumption of materials and fuel supplied to a residential construction combine for the manufacture of reinforced concrete are wholly ignored.

Of what do these expenditures consist? The manufacture of 2.76 cubic meters of precast reinforced concrete, which is installed by a single worker in one shift, requires 4 man-shifts at a reinforced concrete products plant (assuming an average labor productivity of 0.7 cubic meters a shift).

Total labor expenditures on the manufacture of 2.76 cubic meters of keramzit-concrete panel and its installation amount to 5 man-shifts, ignoring labor expenditure on the production of metal for fittings, ceramic or other panels for external facing, and fuel for steam curing of the panels. Production of the same quantity of laid brick requires 2.2 man-shifts (2.76 : 1.25). The manufacture of keramzit gravel and keramzit sand consumes the same amount of labor as manufacture of the same quantity of brick for 1 cubic meter of wall.

1. See PEREDOVOY OPYT V SEL'SKOM STROITEL'STVE No 9, 1978 p 12.

Since a wall laid with 2.5 courses of brick has a thickness of 66 cm and a keramzit-concrete panel is 40 cm thick, we increase these expenditures by 60 percent, and reducing them to 1 square meter of wall we obtain 3.5 man-shifts. Since brick walls require plastering, we add another 0.5 man-shifts for this operation, assuming a plasterer to have a productivity of 12 square meters a shift, obtaining 4 man-shifts. The ratio of total labor expenditures on the installation of an external wall made of keramzit-concrete panels to expenditures on one made of brick is thus 5 : 4 (for different latitudes this ratio may change somewhat in either direction), and leaves out expenditures on materials, raw materials, fuel and electrical energy occurring before these reach the reinforced-concrete panel plant.

Thus the changeover from brick walls to single-layer keramzit-concrete panels at the current stage of development of the construction industry will not decrease total labor expenditures on construction. Rather, labor expenditures and heat losses in the use of the dwelling will be increased, the user value will be decreased, excessive quantities of metal, cement and facing material will be consumed and there will be expensive steam curing of the panels. Heating the clinker required for production of the cement used to manufacture 1 cubic meter of keramzit-concrete panel requires 60 kg of standard fuel, while 70 kg is required for steam-curing the panels. In addition, production of keramzit and keramzit sand requires another 206 kg of standard fuel. As a result, each cubic meter of keramzit-concrete panel requires 336 kg of standard fuel, while the production of 400 bricks (drying and heating) requires only 95 kg, or 2/7 as much.

The concept of degree of prefabrication[2] has been introduced for technical-economic evaluation of building and installation plans. For buildings with panel walls, the degree of prefabrication is 60 percent, while it is about 50 percent for brick dwellings as a result of the cost of the brick required for construction of load-bearing walls. Indeed, in terms of labor intensity the difference resides only in the assembly of load-bearing walls, since all internal partitions, ceilings, sanitary units [sankabiny], elevator shafts, stairways and other preassembled units are the same for these two types of building. However, the idea has taken root that panel dwellings are completely prefabricated, while dwellings with brick walls cannot be considered prefabricated. The degree of prefabrication is customarily considered to be zero for the latter and 100 percent for panel buildings, which of course is incorrect.

2. The degree of prefabrication of buildings and installations is defined as the ratio (as a percentage) of the estimated cost (collected at site) of prefabricated structural members and parts, along with preassembled units of sanitary engineering, electrical and technological systems, included in the total amount of construction and installation work to the estimated cost of all construction materials, prefabricated members and parts and preassembled units.

In building construction making use of state resources, the percentage of buildings with brick and panel walls was equal in 1978. On the basis of the thickness of panel and brick walls and the volume of production of wall panels for dwelling construction, which in 1977 was 20 million cubic meters, we can make a rough estimate that about 37 million cubic meters of brick and block out of the total quantity of masonry laid (155 million cubic meters) was used in dwelling construction.

During the Ninth Five-Year Plan the quantity of dwelling construction was 110 million square meters a year. It has remained at that level during the Tenth Five-Year Plan. Nobody is planning to decrease the output of brick. Thus there arises the question: Why is it necessary to increase the proportion of panel-type dwellings and to further increase the use of brick in dwelling construction? To the contrary, not 30 million but 50-60 million cubic meters of brick should be allocated for dwelling construction and its use in industrial construction correspondingly decreased, thereby decreasing the construction of panel-type dwellings.

This question merits special attention, since in the last ten years the consumption of thermal energy per meter of dwelling construction has doubled, primarily as a result of large heat losses in panel-type dwellings (because of poor-quality joints between panels). With the same material and labor resources expended in construction, it would be possible solely by a certain redistribution of them between industrial and dwelling construction to increase the number of dwellings with brick walls and thus to decrease domestic heat loss significantly.

The outside facings of panel dwellings are not durable and rapidly lose their appearance as a result of atmospheric action. Shortly after construction is finished such dwellings look slovenly and uninviting. Panel-type dwellings also require considerably greater expenditures on repair than brick dwellings. In addition, there have arisen purely technical problems associated with condensation of water vapor on the joints between panels, the appearance of mold, and in many cases even leakage and freeze-through. It should be noted that it is not only the exterior walls that freeze through, but the interior load-bearing walls as well. They are made of cold-weather concrete, and when they come in contact with outside air at the joints they are cooled quickly. As these dwellings settle, cracks appear, as a result of which cold bridges are formed. As the exterior temperature decreases, heat losses increase rapidly, and the apartment dwellers are compelled to use gas burners for heating, so that gas consumption increases rapidly during cold spells; the consumption of electrical energy for heaters also increases.

Brick differs from many modern materials by its high thermal and sound insulation qualities, and its freedom from shrinkage and cracking. Practice indicates that it is possible to build tall buildings with brick load-bearing walls. The 14-16 story dwellings in Moscow are an example.

The decisive factor in developing economical ceramic wall material is the changeover to mass production of effective perforated brick and block, which will improve the technical and economic performance indicators of production and make possible a decrease of 20-30 percent or more in consumption of wall material. Although they are effectively the basic type of brick and block products in a number of republics (72.5% in Lithuania, 65.5% in Latvia, 25.0% in Estonia and 43.9% in Kirgizia), for the USSR as a whole the output of hollow brick with a hollowness figure of up to 25% is only 9.6%. There is almost no production of brick with a hollowness figure of 50-70%, which is used extensively abroad.

Of all the varieties of structural materials used in building, the output of brick is the largest, and apparently will remain so in the near future in spite of the fact that further growth of production has practically ceased. However, the construction of dwellings with brick walls could be significantly expanded by increasing the percentage of perforated brick in overall brick production. The implementation of a complex of technical measures in existing brick plants and the construction of new automated lines would make it possible in the next few years to organize the mass production of cost-effective brick and ceramic block everywhere and make them account for 40-50 percent of the total quantity of brick produced. Expanded use of lightweight brick walls is also important in improving masonry technology.

We now compare labor expenditures on precase and in-situ reinforced concrete structural members. This is rather difficult, since statistical reporting on in-situ concrete is lacking. In contrast to precast members, in-situ concrete is included in nonindustrial production.

In the 50's, almost all roofing and flooring in buildings made of block was in-situ reinforced concrete. The labor consumed in this work was considerable. Considerable labor expenditures were required for the building of one-time wooden casings, and even more labor was expended on their removal. Almost all of the concrete cast in column and floor casings was prepared by hand.

The use of standard casings and the pouring of concrete with cranes and special pallets by the "crane-pail" system was considerably delayed. With this method, the total labor expenditures (both on-site and in preparation of concrete at the plant) were considerably less in natural terms than for precast reinforced concrete. Then sliding casings became available and concrete pumps began to be used to pump concrete to almost any floor. This made it possible to increase worker labor productivity by a factor of 3-4 in comparison with crane-bucket puring. In-situ constructions called "steel-reinforced concrete" in which sheet steel in the form of shaped decking replaced reinforcing rods was used in constructing the Sheremet'yevo Airport. This decking serves as both casing and reinforcement for in-situ steel-reinforced concrete floors. The concrete is pumped onto the decking and leveled, which concludes work on the flooring. In Sochi it took 18 days to pour the concrete for a hotel using sliding casings and supplying cement by the crane-bucket method. Compared with similar hotels made with precast reinforced concrete, the amount of concrete used was decreased by 37 percent, metal consumption by 24.5 percent and estimated cost by 20 percent.

In spite of such successful experiments, the pouring of in-situ reinforced concrete has not yet reached a desirable level of development here. Its share of the total does not exceed 1 percent. The production of concrete pumps and movable casings has not been organized. The construction industry's production base is oriented only toward precast reinforced concrete. The extensive use of in-situ concrete is hindered not only by the degree-of-prefabrication index but also by the present system of prices in which it is more profitable to use precast than in-situ concrete. As an illustration we may give prices per cubic meter of materials and structural members delivered to the construction site by a cost-accounting brigade:

precast reinforced concrete	60 rubles
red facing brick and mortar for 1 cubic meter of masonry work	22 rubles
commercial concrete	19.6 rubles.

We now consider how the prices for these materials affect worker output and plan fulfillment in contracting work. In the installation of precast concrete members, the norm for worker output is 2,5 cubic meters a shift. Accordingly, assuming a wage of 10 rubles a shift, output in money terms comes to 160 rubles. In laying block, the productivity norm per worker per shift is 1.2 cubic meters, the cost of materials used per shift is 26.4 rubles and the wage is 10 rubles. Thus in money terms the output per shift is 36.4 rubles, 5/22 of that for installation of precast concrete. In pouring 4 cubic meters of in-situ concrete per shift, the cost of materials is 78.4 rubles and the wage 10 rubles, so that the total output is 88.4 rubles, or 2/9 that for precast concrete, even though in natural terms it is almost twice that for the latter. Thus the construction organizations have an interest in including more expensive materials in their estimates.

In spite of this defference in prices for materials and structural members, according to accounting by the USSR State Statistical Administration dwellings made of precast reinforced concrete are the cheapest (although only by 4-7 percent). This is because, first, overhead expenses for precast concrete dwellings have been set at 13.5 percent and those for block dwellings at 20 percent. Second, the vast majority of panel-type dwellings are built in areas of mass construction according to standard plans, while block buildings are primarily in point construction where old buildings are being removed, and generally are built to individual plans with better layout and finishing and superior amenities. At the same time, according to data from GIPRONIIzdrav [health facilities planning and research institute] the estimated price of construction and installation work for frame-and-panel hospital buildings exceeds that for similar brick buildings by 18 percent. According to data from TsNIIEP [Central Scientific Research Institute of Experimental Planning], frame-and-panel school buildings are 10-14 percent more expensive than brick ones.

The higher prices for precast concrete items make it easier to fulfill contracting plans and lead to higher wage funds and increased labor productivity indicators in money terms. Accordingly it is quite understandable that the construction organizations do not favor plans calling for cheaper types of construction than precast concrete.

In order to justify the extensive use of precast reinforced concrete, total labor expenditures are compared under completely nonequivalent conditions (e.g. layout and finishing of buildings), while labor expenditures for the materials delivered to the reinforced concrete products combines are not taken into account and output is considered separately for industrial enterprises and construction and installation work. All of these factors lead to errors in planning manpower support for the construction industry.

For the Tenth Five-Year Plan, the labor expenditure for precast concrete buildings was fixed at 43 percent below that for brick buildings. On the basis of this figure it was calculated that increasing the degree of prefabrication of buildings to be constructed would make it possible to save 10 percent on construction labor, coming to about 780,000 persons. This calculation cannot stand up to criticism, but nonetheless it is used as the basis for determining manpower requirements for construction and installation work and for the growth of labor productivity in the construction industry. Let us make a comparison of two dwellings with identical layout, finishing and number of floors, one with brick walls and the other with keramzit-concrete panels. The proportion of total labor expenditure devoted to the walls is 20 percent for a brick dwelling, while it accounts for 15 percent of the estimated cost. All other construction members and materials for these dwellings are identical: flooring, stairway units, elevator shafts, floors, window and door units, electrical wiring, sewage, running water, gas and sanitary units. If we imaging a house without walls, the labor saving would be no more than 20 percent. What basis is there for assuming a 43-percent saving on labor?

It has also been proposed to achieve a manpower saving during the Tenth Five-Year Plan by decreasing idle time within the shift. But investigations made by the State Statistical Administration show that in-shift idle time has not decreased, and that this is primarily because of incomplete deliveries of precast reinforced concrete parts to construction sites. A standard-design reinforced concrete dwelling includes 680 different type items. Frequently a brigade is receiving items from 32 different plants. But for block or in-situ concrete dwellings the matter of complete sets of items is considerably simplified.

When we consider questions of increasing worker output in construction and installation work, we must also devote some attention to a factor from which it is proposed to obtain a third of the total increase in labor productivity, namely the development of more productive machinery. But this task has not been accomplished, since the production of the base machines, 300-500 horsepower tractors, is still in the initial stage.

Certain conclusions can be drawn on the basis of the foregoing. The increased labor productivity in the construction industry during the Eighth and Ninth five-year plans was primarily the result of increased output not in natural terms but in monetary terms. This is because of the structural shifts which resulted from accelerated development of the production of more expensive reinforced concrete items and the retarded growth of masonry, the use of in-situ reinforced concrete, and a decrease in the quantity of wooden dwelling construction and of metal structural members used, resulting in decreased monetary and total labor expenditures. The high labor expenditures on factory production of precast reinforced concrete are included in the output of workers on the construction site, as a result of which the indicators of growth of labor productivity by the builders expressed in money terms improved significantly.

During the Tenth Five-Year Plan, the rate of production of precast concrete has decreased sharply. While during the Eighth and Ninth five-year plans the annual increase was 5.6-5.7 million cubic meters, during the Tenth Five-Year Plan it has not exceeded 2.5 million cubic meters, or a rate of 2 percent, which now can make no significant contribution to increased output in money terms for workers in the general construction ministries. In addition, during the Tenth Five-Year Plan the increase in output of steel construction members has accelerated. About 100 plants are currently producing such items. Their output exceeds 6 million tons a year, as compared with 1.5 million tons at the beginning of the Ninth Five-Year Plan.

The main work on production buildings made from metal parts is done by specialized ministries, while the job of the general contractors boils down to laying the foundations, putting in flooring and interior partitions and finish work. Thus the real bread-and-butter work, the installation of precast load-bearing reinforced concrete members, has disappeared from among their functions, as a result of which worker output in money terms has decreased and the quantity of construction and installation work has not grown. During the Tenth Five-Year Plan wooden dwelling construction dwelling construction has begun to expand and in-situ concrete and reinforced concrete are coming into wider use, which is also decreasing the general contractors' output in money terms.

The price of precast reinforced concrete wall foundations is 2-2.5 times as great as that of in-situ foundations, while worker output in the installation of these foundations is 3-4 times as great. Previously this increased cost was explained in terms of a stepped-up pace of construction. But how can it be explained now, when in-situ foundations have become even cheaper and are alid faster than precast ones?

One aim of the expansion of technical progress in the construction industry is decreased material consumption. Fewer materials should be used per unit area made available, and they should be cheaper. In the process, labor productivity measured in money terms will inevitably decrease. This is the essence of the contradictions which are holding back the technical progress of the construction industry.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Improvement of Production Efficiency and Work Quality," adopted in June 1979, assigned Gosstroy USSR together with the construction ministries the task of implementing, during 1979-1980, measures aimed at preparing the estimation and standards base for a gradual transition during the 11th Five-Year Plan to the planning of labor productivity in the construction and installation organizations in terms of net (normative) output or some other indicator which more accurately reflects changes in labor expenditures. In our view, the increase in labor productivity in natural terms based on output norms (independent of the fact that output in money terms may decrease in some cases) is an indicator which could play an important role. No assignment for increasing labor productivity in natural terms has yet been included in a plan. In 1977 the output of a mason in the RSFSR Ministry of Agricultural Construction was 1.25 cubic meters a shift, that for the best brigades was 2.5 cubic meters, and that in a competition between different trades was 4.6 cubic meters. This shows quite convincingly that better masonry processes are in existence, but their incorporation has not been called for by any plan. The laying of lightweight brick walls has not been disseminated. One thing has made it possible to increase the labor productivity of masons: movable scaffolding.

The USSR Central Statistical Administration had 23 indicators of plan fulfillment applicable to the incorporation and expanded use of progressive methods of construction in 1977, 10 of which applied to precast reinforced concrete, 7 to metal structural members and one each to modular installation of equipment, glued wood members, conduitless laying of heating networks, and the use of channel cross-section glass. As can be seen, none of these indicators applied to masonry, in-situ concrete or in-situ reinforced concrete. A great decrease in material consumption on in-situ reinforced concrete results from the use of poured foam concrete. Foam is introduced into the concrete mixture. The resulting poured foam concrete has a density of 400-1,600 kilograms per cubic meter, as compared with 2,000 kilograms per cubic meter for ordinary concrete.

The development of in-situ reinforced concrete has reached a level at which the time required for construction of large buildings is measured in days rather than years. For example, an American construction company in Florida built a reactor building 58 meters high and 47 meters in diameter with walls 91 centimeters thick in 17 days using a sliding casing. It would have taken 14 months for the same company to construct a similar building using ordinary movable casings.

In spite of the large number of plan indicators applicable to expanded use of progressive precast reinforced concrete construction (10), in effect they include no measures aimed at improving the production and installation of precast concrete which would make it possible to increase productivity in comparison with previous accounting periods.

Millions of rubles worth of construction and installation work using large-size components, assemblies, panels and modules has been ordered. But most of this involves obsolete types of structural members including non-prefabricated types. This is the state of affairs in large-panel and modular-unit dwelling construction as well.

As a result of stagnating technical progress in the application of precast reinforced concrete, the labor productivity of workers employed in the installation of reinforced concrete parts is not increasing. We have already mentioned the average productivity of a worker engaged in installing reinforced concrete members: 2.76 cubic meters per shift. Advanced brigades have achieved an output of 4.65 cubic meters, 1.7 times as high.

The possibility of increasing labor productivity in the utilization of precast concrete members depends on increased panel area with a corresponding decrease in thickness and density. Our keramzit-concrete panel is 5 times thicker and 5-6 times as dense as its French counterpart, which means that per square meter of wall it is 25-30 times as heavy. An increase in panel dimensions will decrease the time required for installation of walls and floors and finishing joints, while improved thermal insulation characteristics and decreased density will make it possible to decrease material consumption for both enclosing and load-bearing members in buildings.

Of interest in connection with the development of steel structural members in our country is the experience of the Ministry of Power and Electrification in carrying out countruction abroad. This ministry mastered factory production of 18-meter sections of single-story industrial buildings, In two working shifts, a five-man brigade can assemble a building with an area of 1,000 square meters from these sections, while they could complete only 20 square meters in piece-by-piece assembly of metal structural members.

In our view the main cause for decreased effectiveness of capital investments is the great structural shift toward expanded use of more expensive precast reinforced concrete. In spite of the high production cost of this material, plants producing precast reinforced concrete parts and structural members have an inordinately high profitability. For example, profitability reaches 55-66 percent in the enterprises on the Ministry of Agricultural Construction.[3]

Accordingly we must first of all alter the proportion in the development of production of precast and in-situ reinforced concrete, as well as of wall materials, by favoring cheaper types with better qualities. In identifying structural shifts we must also take into account the extremely high cost of construction industry facilities for the production of precast reinforced concrete, which is 3 times that of the construction base for in-situ reinforced concrete. The higher costs of precast reinforced concrete members and the higher one-time expenditures on the construction base in comparison with in-situ concrete cound be compensated by the effect resulting from decreased time required for construction. But such suggestions have not been borne out. Using current processes, the construction of buildings and installations from in-situ reinforced concrete requires less time and labor.

The possibilities for tehhnical progress in the construction industry are immense, but it will be impossible to correct the situation in capital construction without instituting serious measures to incorporate more progressive processes. The use of lightweight insulators instead of keramzit-concrete and a switch in reinforced concrete products plants and dwelling construction combines from the production of single-layer keramzit-gravel wall panels to three-layer panels made of thin large-dimension plates are the main ways to improve the technology of large-panel construction. In addition, the expansion of concrete pouring by means of pumps and of lightweight brick walls should be undertaken.

3. See PEREDOVOY OPYT V SEL'SKOM STROITEL'STVE No 2, 1978, p 12.

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CONSTRUCTION, CONSTRUCTION MACHINERY, AND BUILDING MATERIALS

MOLDAVIAN BUILDING-MATERIALS INDUSTRY CAPITAL INVESTMENT UNBALANCED

Kishinev IZVESTIYA AN MOLDAVSKOY SSR, SERIYA OBSHCHESTVENNYKH NAUK in Russian No 2, 1979 pp 15-25

[Article by P. Ye. Tsurkan: "An Analysis of the Capital-Investment Structure of the Moldavian SSR Building-Materials Industry"]

[Text] The Moldavian SSR building-materials industry is one of the republic's leading branches of heavy industry. It has an exceptionally important role in promoting capital construction and in speeding up the pace of introducing facilities and capacity into operation. The quality of construction and installing work, the level of rhythmicity of construction output, and, based thereon, support for growth in construction-enterprise operating effectiveness are linked inextricably with the pace of growth in the output of building materials and with improvement in the structure and quality thereof.

The building-materials industry exerts a considerable influence on the development of other branches of both the material and nonmaterial spheres. Construction time and quality and the cost and longevity of the facilities being erected for the country's economy depend upon the dynamism of developing the production of construction materials and of realizing the achievements of scientific and technical progress in this branch of industry.

V. I. Lenin, in characterizing the role and importance of the building-materials industry in developing the machinery industry, noted that "one of the necessary prerequisites to the growth of a large machinery industry (and an extraordinarily characteristic companion of its growth) is development of the industry that produces fuel and materials for construction projects and of the construction industry."[1]

High development rates and constant improvement of the production structure are characteristic for the Moldavian SSR building-materials industry, as they are for all the republic's industry. The pace of growth and the structure of production of this industry are of a relatively independent nature, because they are based on the task of satisfying the requirements of the republic's capital construction--the basic customer for output of the building-materials industry. Capital construction requires that anticipatory development of the production of effective building materials, structure and articles and a further rise in their quality, reliability and degree of fabrication at the factory, as well as the preparation of complete sets of them for delivery to construction projects at the prescribed times, be provided for. These requirements are dictated by the need to further industrialize the whole construction cycle, and to reduce the time taken to erect facilities, thereby providing for growth in labor productivity and improvement in the use of machinery and mechanisms and material, labor and energy resources in construction.

Capital construction, as affected by the scientific and technical revolution, determines the production structure of building materials, as well as the pace and proportions of their development. So the development of these two branches of production should be viewed in a mutually related and intimate unity, as the development of a single regional production complex.

This article devotes attention basically to an analysis of the departmental, branch, technological and reproduction structure of capital investment and certain trends that have prevailed in the Moldavian SSR building-materials industry during the last 12 years.

The Moldavian SSR building-materials industry is one that has many branches. It includes such subbranches as the cement industry, the industry for producing prefabricated reinforced-concrete and concrete articles and structure, the industry that makes wall materials and quarried building materials and porous aggregates, the industry for the quarrying and processing of facing material made of natural stone and for producing limestone, gypsum and local cementing materials and articles made therefrom, and the industry for roofing and water-proofing materials. The subbranch of the building-materials industry that produces constructional wooden structure and carpentry articles has been developed widely in the republic.

In the Moldavian SSR the main supplier of building materials is the Ministry of Construction Materials Industry. Its share in production in 1977 was 100 percent for cement, asbestos-cement sheet (roofing) and pipe, 55.6 percent for reinforced-concrete articles, 55.1 percent for brick, 41.6 percent for wall blocks made of natural stone, 74.6 percent for crushed rock, 100 percent for gypsum, 83.3 percent for builders' lime, 87.3 percent for sand and 100 percent for soft roofing. It is well known that the Moldavian SSR industry, like the industry of the country as a whole, has undergone profound progressive changes in accordance with decisions of the 24th and 25th CPSU congresses.

The CPSU has adopted the policy of a sharp rise in the role of intensive factors in providing for further growth in the effectiveness of social production, based on intensification of the processes of improving organization of the management of industry.. Decisions of the 25th CPSU Congress and the decree of the CPSU Central Committee and USSR Council of Ministers of 2 March 1973, "Certain Measures for the Further Improvement of the Management of Industry,"[2] point to the need to enlarge enterprises, create production associations, raise the level of concentration and specialization of production, and eliminate small enterprises and departments that use manual labor, obsolete equipment and lagging technology.

The CPSU and USSR Council of Ministers decisions to further improve the management of industry has been implemented appropriately only in such subbranches of the republic's building-materials industry as the production of wall materials and quarried building materials. The Kishinev production association Nerudstrom and the Krikov Quarrying Association, which are subordinate to the Moldavian SSR Ministry of Construction Materials Industry, are operating in these subbranches at present. These progressive changes still have not been applied, unfortunately, to other subbranches of the building-materials industry, primarily such a subbranch as the industry for prefabricated reinforced-concrete and concrete structure and articles, which is so promising in this regard. On the contrary, the building-materials industry, especially the production of prefabricated reinforced concrete, is increasingly being dispersed over a multitude of other ministries and agencies of the republic, leading to a dispersion of capital investment and a reduction of its effectiveness as well as of the effectiveness of social production as a whole. At present, aside from Moldavian SSR Ministry of Construction Materials Industry enterprises, building materials are being produced at enterprises subordinate to the ministries of construction, rural construction, the construction and operation of roads, land-reclamation and water resources, municipal services, and local industry, Moldglavenergo [Main Power Administration of the Moldavian SSR], Mezhkolkhozstroy [Interkolkhoz Construction Association] and others.

Production-type capital investment for developing the building-materials industry of the republic's ministries and agencies during the Eighth and Ninth five-year plans and the first 2 years of the Tenth are shown in table 1.

Table 1

Departmental Structure of Capital Investment for Production Purposes in the Moldavian SSR Construction Materials Industry, by Percent of the Total*

Ministries and agencies	1966-1970	1971-1975	1976-1977
Total capital investment	100.0	100.0	100.0
By ministry:			
Building-materials industry	82.0	67.4	71.8
Construction	0.5	3.8	1.0
Rural construction	1.1	4.7	0.7
Land reclamation and water resources	4.3	2.6	2.1
Municipal services	0.1	-	0.2
Local industry	0.1	0.5	1.0
Construction and operation of roads	-	0.9	1.0
Moldglavenergo [Main Power Administration of the Moldavian SSR]	0.1	0.1	-
Mezhkolkhozstroy [Interkolkhoz Construction Association]	11.8	20.0	22.2

*The grouping of capital investment by ministries and departments has been

Table 1 data testify to the fact that the main share of capital expenditures for the building-materials industry goes to enterprises subordinate to the Moldavian SSR Ministry of Construction Materials Industry and to the Mezhkolkhozstroy Association. Major changes occurred in the departmental structure of capital investment during the 12 years being analyzed. The share of the Ministry of Construction Materials Industry in the total of the republic's capital investment that was directed to developing the building-materials industry was reduced appreciably. It was reduced from 82 percent in 1966-1970 to 71.8 percent in 1976-1977, while Mezhkolkhozstroy's share of capital investment doubled--from 11.8 percent during the Eighth Five-Year Plan to 22.2 percent in 1976-1977.

The interests of the modern scientific and technical revolution, a rise in the quality and level of factory preparation of output, and improvement in the use of material, labor and financial resources dictate the urgent necessity for a radical change in the practice of interbranch distribution of capital investment in the republic's building-materials industry.

It is necessary to further develop the materials and equipment base of the building-materials industry and to expand production (by new construction, among other measures) on the basis of the republic's Ministry of Construction Materials Industry, since the main portion of highly qualified workers and engineers and technicians who have gained major work experience has been concentrated here. There are within this ministry's framework broad possibilities, especially in the industry for prefabricated reinforced-concrete and concrete structure and articles, for the concentration, specialization and cooperation of production. This will serve as a decisive base for growth of the effectiveness of capital investment and of production as a whole.

The distribution of capital investment among various building-materials subbranches is affected by the increasingly changing structure and nature of modern capital construction and the requirements of the scientific and technical revolution, both in construction and in the production of building materials.

In the Moldavian SSR, as in the country as a whole, in 1966-1977 the building-materials subbranch that produces prefabricated reinforced-concrete and concrete articles and structure has been further developed. Larger sums of capital investment are being directed toward it, as a most promising branch, one that exercises a decisive influence on the intensity of growth and industrialization of capital construction (table 2). In 1967, for example, 48.7 percent of the total volume of capital investment for the republic's production of building materials was directed toward developing the prefabricated reinforced-concrete subbranch. This indicator was 36.5 percent in 1970, 35.9 percent in 1974, 34.8 percent in 1975 and 30.8 percent in 1977.

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prepared for the first time (based on data from the current files of Moldavian SSR Central Statistical Administration) by the Sector for the Effectiveness of Capital Investment and New Equipment of the Economics Institute of the Moldavian SSR Academy of Sciences.

Table 2

Branch Structure of Capital Investment for Production Purposes in the Moldavian SSR's Construction Materials Industry*

Branches of the building-materials industry	1966-1970	1971-1975	1976-1977
Total capital investment	100.0	100.0	100.0
By subbranch of the industry:			
Cement	15.3	15.1	27.6
Soft roofing and water-proofing materials	1.1	0.5	0.4
Prefabricated reinforced-concrete and concrete structure and articles	37.5	35.6	29.6
Wall materials	17.5	13.8	8.3
Quarried building materials	20.4	13.8	18.5
Mining and processing of facing material made of natural stone	1.0	1.9	1.3
Limestone, gypsum and local cementing materials and products made therefrom	3.9	4.3	1.1
Thermoinsulating materials	-	3.1	6.5
Porous aggregate	-	5.1	4.2
Wooden constructional structure and carpentry products	2.5	4.2	2.5
Other branches	0.8	2.6	-

*Computed from data from the current files of Moldavian SSR Central Statistical Administration

In the period that we are examining, major capital investment was allocated to such an important subbranch of the republic's heavy industry as the cement industry, which determines to a very great extent the development of all branches of the republic's economy, primarily the production of prefabricated reinforced-concrete structure and articles, as well as capital construction.

In expanding the rebuilding the firstling of the Moldavian SSR's cement industry, 17.5 percent of all capital investment for the republic's building-materials industry was directed in 1968 to the Rybnitsa Cement-Roofing Combine imeni Oktyabr'skaya Revolyutsiya, while the figures were 30.9 percent in 1969, 20.2 percent in 1972 and 12.9 percent in 1974. Construction started in 1975 on the Rezina Cement Plant, where, as construction and installing work has progressed, the share of capital investment in the cement industry grew substantially in both 1976 and 1977, reaching, respectively, 28.8 and 26.3 percent.

In 1966-1977 substantial capital investment was also allocated to the subbranch of the building-materials industry that produces wall materials. As a whole, during the Eighth and Ninth five-year plans and 2 years of the Tenth, 35.2 million rubles, or 13.3 percent of all the industry's capital expenditures, were allocated here.

Of all the capital investment directed toward developing the production of wall materials during the period under study, 43.2 percent of it was devoted to expanding and rebuilding the Kishinev Building-Materials Combine and the Tiraspol'skiy Brick Plant and reequipping them with machinery, and 56.8 percent was the share for enterprises that quarry natural stone for wall materials. The process of building up this industry's technical potential was most intensive in 1967-1973.

The republic's industry for quarrying building materials has been in third place among other subbranches of the building-materials industry in capital investment, following the industry for prefabricated reinforced-concrete and concrete structure and articles, and the cement industry. Throughout the whole period being examined, capital investment in this subbranch was substantial. Its share fluctuated by year within the 14-24 percent range. During the period being examined, 16.7 percent of all capital expenditures for the building-materials industry was allocated here. Nevertheless, the rates of growth of capital investment in the quarried building-materials industry that were sustained for a number of years did not provide for the required growth in production. While, during the Ninth Five-Year Plan, the rate of growth in capital investment in developing the materials and equipment base of the republic's construction industry was 155 percent that of the Eighth Five-Year Plan and it was 179.3 percent in the industry for prefabricated reinforced-concrete and concrete structure and articles, it was only 127.8 percent for the production of quarried building materials. Such a ratio in capital investment growth rates in the indicated subbranches inevitably leads to violation of the proportionality of development of the construction industry and the production of prefabricated reinforced concrete. This will be reflected negatively in the fulfillment of plans for capital construction and the production of prefabricated reinforced concrete in the republic.

The interests of capital construction and the industry for prefabricated reinforced-concrete and concrete structure and articles require an outstripping pace of development in the production of quarried building materials, for the republic has begun to feel increasingly the shortage thereof recently. For this purpose, it is necessary to change radically the practice of distributing capital investment in subbranches of the republic's building materials industry, sharply increasing, in so doing, the share of capital expenditures for the quarried building-materials industry.

The production of cement, prefabricated reinforced-concrete and concrete articles and structure and the production of wall materials and quarried building materials are leading subbranches of the building-materials industry. In practice, they determine the pace of growth and further prospects for the development of capital construction in the republic. The indicated industries' share during the Eighth and Ninth five-year plans and the first 2 years of the Tenth was, respectively, 90.7, 78.3 and 84.0 percent of all capital expenditures allocated to the building-materials industry.

By the end of the Eighth Five-Year Plan capacity that basically met the requirements of the republic's economy had been created at enterprises for the production of prefabricated reinforced-concrete and concrete articles and structure and of wall-building materials. This made it possible during the Ninth and at the start of the Tenth five-year plans to reduce capital expenditures in the indicated subbranches and to redistribute them in favor of the industry for the quarrying and processing of facing material made of natural stone, the industry for limestone, gypsum and local cementing materials and of articles made of them, and the production of wooden structure and carpentry products.

Improvement of the branch structure of the building-materials industry reflects the achievements of the modern scientific and technical revolution in this industry and the growing demands of capital construction on the structure and quality of the building materials being consumed. The profound changes that are occurring in the building-materials industry structure invariably are accompanied by improvement of the production apparatus itself. This problem always has been and still is at the center of attention of the CPSU and the Soviet Government. It was reflected in the Party Program and received further creative development in the decisions of the 24th and 25th CPSU congresses. These documents give the basic principle about the necessity for stepping up the pace of increase in capital investment for equipment, machinery and mechanisms.

Basically positive changes in the technological structure of capital investment occurred at Moldavian SSR building-materials industry enterprises during the Ninth Five-Year Plan. These changes can be illustrated more graphically by the individual subbranches. The grouping that we have made by subbranch of the republic's building-materials industry (not counting the Mezhkolkhozstroy Association), which shows the changes in the technological structure of capital investment, indicate that the share of capital investment for construction and installing operations increased only in the production of cement, limestone, gypsum and local cementing materials and of articles made of them during the Ninth Five-Year Plan (in comparison with the Eighth). In the cement industry the share of these expenditures grew from 49.3 percent during the Eighth Five-Year Plan to 56.0 percent during the Ninth, and, in the industry for limestone, gypsum, and local cementing materials and products made therefrom, from 53.9 to 60.6 percent.

In the other subbranches of the republic's building-materials industry, a persistent trend prevailed during the Ninth Five-Year Plan and the first 2 years of the Tenth toward a growth in expenditures for equipment, machinery and mechanisms. In the industry for prefabricated reinforced-concrete and concrete structure and articles, expenditures for equipment rose from 47.9 percent during the Eighth Five-Year Plan to 51.9 percent in 1976-1977, in the wall-materials industry from 44.2 to 58.4 percent, in the industry for quarrying and processing facing materials made of natural stone from 35.1 to 55.6 percent, and so on. For the republic's building-materials industry as a whole, the share of capital investment in the active portion of fixed production capital for 1966-1977 was invariably reduced (table 3).

Table 3

The Technological Structure of Capital Investment for Production Purposes in the Moldavian SSR's Construction Materials Industry in 1966-1977,* in Percent of the Total

Indicators	1966-1970	1971-1975	1976-1977
Total capital investment................	100.0	100.0	100.0
For:			
Construction and installing work.....	49.5	53.2	54.4
Equipment, tools and implements......	45.6	42.9	41.5
Other capital operations and expenditures......................	4.9	3.9	4.1

*Computed from data from the current files of Moldavian SSR Central Statistical Administration.

An analysis of the technological structure of capital investment of individual Moldavian SSR ministries and agencies is of interest.[3] For the Moldavian SSR Ministry of Construction Materials Industry, which is the main supplier of building materials in the republic, capital investment for construction and installing work during the Ninth Five-Year Plan rose by 4.2 points over the figure for the Eighth Five-Year Plan; this is much higher than the growth of these expenditures for the Moldavian building-materials industry as a whole. This considerable growth in capital expenditures for construction and installing work occurred through the construction of new capacity and the expansion of existing capacity. During the Ninth Five-Year Plan an expansion of production capacity was effected at the Rybnitsa Cement-Roofing Combine imeni Oktyabr'skaya Revolyutsiya, the Bel'tsy Keramzit Gravel Plant and other enterprises through new construction.

Expenditures for equipment for the ministries of land reclamation and water resources, construction, and rural construction of the Moldavian SSR grew substantially. During the Eighth Five-Year Plan they consisted of, respectively, 28.3, 31.3 and 21.0 percent, and, during 1966-1977, 85.5, 54.5 and 36.4 percent.

The 25th CPSU Congress has directed planning and managing organs to further improve the structure of capital expenditures for the reproduction of the fixed capital of the country's economy. In so doing, special attention was paid to the necessity for a more intensive increase in capital investment for expanding and rebuilding existing enterprises and for reequipping them with machinery. The principal was stated at the congress that capital investment will be allocated not to branches of the economy and to enterprises in general but to growth in the output of products. Nevertheless, a firm tendency was noted in the Moldavian SSR building-materials industry in 1972-1977 toward a growth in the share of capital investment for new construction. The share of capital investment for the construction of new enterprises in the period indicated was: 17.1 percent in 1972, 29.8 in 1973, 50.5 in 1974, 65.7 in 1975, 73.1 in 1976 and 72.4 in 1977.[4] This is explained by the fact that during this period the construction of a large number of construction-industry enterprises--the Rezina Cement Plant, the Kishinev Housing-Construction Combine, the Kagul plants for large-panel housing construction and for reinforced-concrete articles, the Pervomayskiy Crushing and Grading Plant, the Bendery Thermal Insulation Products Plant, the Bel'tsy Keramzit Plant and the Dnestrovsk Porous Agglomerates Plant--was being started. As a result, an ever-decreasing share of capital investment went into expanding and rebuilding existing plants and reequipping them with machinery.

However, the trend toward a sharp growth in expenditures for new construction was not characteristic of all subbranches of the republic's building-materials industry. For example, expenditures for new construction for the production of prefabricated reinforced-concrete and concrete articles and structure in 1972-1977 was stable and high enough (44.4 percent in 1972, 60.5 in 1973, 82.6 in 1974, 69.7 in 1975, 66.6 in 1976 and 59 percent in 1977).[5] The high growth in expenditures for new construction that existed in the building-materials industry as a whole was not observed here. Unlike other subbranches of the building-materials industry, a substantial growth in the share of capital investment that was aimed at maintaining existing capacity was characteristic for the industry for prefabricated reinforced-concrete and concrete structure and articles during the period being studied. In 1972-1977, 11.2 percent of all capital investment was spent for these purposes, and in 1975 and 1977 these expenditures reached 15.9 and 29.7 percent respectively.

In such subbranches of the building-materials industry as the industries for mining and processing facing materials, limestone, gypsum and local cementing materials and articles made therefrom, for producing soft roofing and water-proofing materials, and for producing wooden structure and carpentry products, all capital investment was allocated to expanding and rebuilding enterprises and reequipping them with machinery.

The realization of plans for the construction of new enterprises, departments and production facilities and the expansion and rebuilding of existing facilities has enabled substantial growth of the republic's production of building materials to be provided. The output of prefabricated reinforced-concrete and concrete articles and structure grew in 1976 to 2.5-fold that of 1965's, while the manufacture of structure and parts with prestressed reinforcement grew 4.1-fold. During the indicated period a high rate of growth in wall-panel production was achieved. In 1976 it surpassed the 1965 level by 44.8 percent. Accordingly, production grew 3.4-fold for crushed rock, 2.2-fold for construction sand, 1.5-fold for gypsum, and so on. A significant growth in the production of still other types of building materials also was provided for.

It must be noted that in the Moldavian SSR the share of volume of production of prefabricated reinforced-concrete structure and parts with prestressed reinforcement in the total volume of prefabricated reinforced concrete was lower than for the country as a whole. While in 1977 this indicator was 23.3 percent for the country, it was 21.5 percent for Moldavia, although the pace of growth in production of reinforced concrete with prestressed reinforcement in 1965-1977 in our republic was higher than for the country as a whole. Capital investment for expanding capacity for the production of reinforced-concrete with prestressed reinforcement must be increased, with a view to bringing its share in total output up to the All-Union level.

As the construction of new facilities is completed, it is necessary to change radically the practice of planning capital investment for the building-materials industry. The time has come when it is increasingly necessary to renovate production equipment and to remove from operation on a planned basis machinery that is worn or obsolete. This must be done primarily at enterprises that are subordinate to the republic's Ministry of Construction Materials Industry.

Studies of the operating condition of fixed capital of the Moldavian SSR industry that were carried out in the Department for the Effectiveness of Capital Investment and New Equipment of the Economics Institute of the AN [Academy of Sciences] of the MSSR [Moldavian SSR] indicates that the deterioration process is rapid. The Moldavian SSR Ministry of Construction Materials Industry was in third place in 1966-1977 among Moldavia's industrial ministries and agencies in degree of wear of fixed capital of the building-materials branches. The physical wear factor for fixed capital of the building-materials industry subbranches of this ministry was 0.1 during the Eighth Five-Year Plan, 0.25 during the Ninth Five-Year Plan, and at the end of 1977 the wear factor was 0.33.[6]

The data that mark the operating condition of fixed capital, the scientific and technical revolution in the building-materials industry, and the conditions and nature of the functioning of the production apparatus in this branch of the republic's heavy industry urgently dictate the necessity to allocate substantial resources to the upkeep of existing capacity and to the renovation of fixed capital. For these purposes, 6-7 million rubles of capital investment and depreciation funds must be allocated each year to overhaul.

An analysis of the capital-investment structure in the Moldavian SSR building-materials industry has permitted the discovery of cases of the dispersion of capital investment by a number of ministries and agencies that has led to a reduction in the utilization effectiveness thereof. An inadequately substantiated distribution of capital expenditures among the various building-materials industry subbranches has been attended at times by a reduction in the share of capital investment (for example, in the quarried building-materials industry), or the share thereof in this branch has been sustained at a low level.

In 1966-1977 the branch ministries and agencies allocated inadequate amounts of capital investment to reequipping building-materials industry enterprises with machinery and to maintaining existing capacity. As a result, the share of machinery and equipment in total capital investment during this period was substantially reduced, and the physical wear of capital, primarily the active portion thereof, was extremely intensive. The fitness factor of fixed capital for a number of ministries, agencies, branches of industries, and enterprises was, in 1977 for example, extremely low. Thus, for the MSSR Ministry of Construction Materials Industry as a whole it was 0.67, and for such subbranches of it as the industry for prefabricated reinforced-concrete and concrete structure and articles it was 0.59, the cement industry 0.65, and the quarried building-materials industry 0.63. For 10 out of 28 enterprises of the republic's Ministry of Construction Materials Industry the fitness factor for capital fluctuated in the 0.46-0.55 range, while for the MSSR Ministry of Land Reclamation and Water Resources it was as high as 0.69.[7]

During interagency distribution of capital investment, determinations of the amounts required for developing individual subbranches of the industry and enterprises did not consider the technical condition of the fixed capital and the structure thereof. The dates and level of assimilation of production capacity was not considered.

It is desirable to plan capital investment to take the factors enumerated into account, and also to introduce certain changes into the practice of planning capital investment, particularly in expanding and rebuilding enterprises and reequipping them with machinery, using as a basis for interagency and interbranch distribution of capital investment the indicators that characterize the technical condition of fixed capital in general and of the fleet of machinery and equipment in particular, and the degree of use and dates of assimilation of installed production capacity.

The materials and equipment base of the Moldavian SSR building-materials industry ought to be developed on the basis of a specialized Ministry of Construction Materials Industry, and capital investment for developing this branch of industry within the framework of other branches of the republic's ministries and agencies should be restricted.

It is necessary, first, to increase total capital investment in the building-materials industry subbranch that produces quarried building materials (this will help to eliminate the lags in the production and delivery of crushed rock, gravel and sand that have been noted); and, second, based on the indicators that characterize the status of fixed capital, including the fleet of machinery and equipment, and also, based on the amounts of capital investment for the renovation thereof, establish, upon representation of ministries and agencies, planning tasks for them for withdrawing obsolete equipment from operation and updating it, after coordination with current and long-range plans for delivering domestic and imported equipment to them. This in itself will create the bases for long-range planning for renovating the machinery and equipment fleet and improving the agency, branch and technological structure of fixed capital.

The accomplishment of the indicated measures will enable more purposeful action on the structure and reproduction of capital, especially the active portion thereof, to be provided. This will help in the timely elimination of obsolete and worn equipment and moderation of the pace of the obsolescence of capital. All this taken together will be a most important factor in raising the utilization effectiveness of capital investment, fixed capital and social production as a whole.

FOOTNOTES

1. V. I. Lenin. "Poln. sobr. soch." [Complete Collected Works], Vol. 3, page 525.

2. "Resheniya partii i pravitel'stva po khozyaystvennym voprosam" [Party and Government Decisions on Management Questions]. Moscow, 1974, Vol 9, p 415.

3. Not counting Mezhkolkhozstroy [Interkolkhoz Construction Association] enterprises.

4. Computed according to data from the current files of TsSU MSSR [Moldavian SSR Central Statistical Administration].

5. Ditto.

6. "Narodnoye khozyaystvo SSSR v 1977" [The USSR National Economy in 1977], p 177; and "Narodnoye khozyaystvo MSSR 1977" [The Economy of the Moldavian SSR, 1977], p 51.

7. Computed on data from the current files of TsSU MSSR.

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