

tinuing complaints in the Soviet press and the frequent changes in the incentive system suggest that it does not work well.

Since the people with whom we talked in the Soviet Union did not admit any weakness in the incentives for innovation we were unable to discuss with them reasons for the inadequacy. Nevertheless, certain hypotheses are suggested by the description of the incentive system pieced together in our interviews.

First, obtaining an ad hoc award for innovation seems to involve a great deal of red tape and numerous discretionary decisions by higher-ups. This may lead to uncertainties that reduce the force of the incentives.

Second, there is a general ceiling on the premium that an individual may earn for enterprise cost reduction, the ceiling being equal to 40 per cent of base pay. While we were unsuccessful in efforts to learn the specific schedules of the premium system, it appears that in many cases the enterprise had already reached its ceiling. If so, there would not only be no further incentive for cost reduction; there would in fact be an incentive to defer cost reduction in order to assure the earning of a premium in the next year.

Third, it did not appear that the incentive system distinguishes sharply between being first to introduce an innovation and being second or third. It may therefore be wise for an enterprise manager to wait for someone else to get the bugs out of a process before he tries it. Alexander Pope's suggestion may be relevant here: "Be not the first by whom the new is tried, nor yet the last to cast the old aside."

IN general, the Soviet incentive system as we heard it described struck me as rather bookish and sentimental, as if it had been devised by a progressive first-grade teacher, who didn't really like anyone to get much ahead of anyone else and who was uncertain whether to reward effort or performance. Another analogy that I find useful in thinking about the Soviet incentive system is the U. S. tax system. Both are complicated ways of rewarding a kind of loose equivalent of the results the society really wants to maximize.

Despite the drawbacks in the Soviet system, however, there seems to me little ground for complacency. Even if it is true, as I think, that the system by which the Soviet Union generates technological advance is not notably efficient, this would not by itself determine the actual pace of advance. An inefficient system run by competent, powerful, determined people may still produce results.

INSIDE THE SOVIET ECONOMY

Industry's Problems and Prospects

By GEORGE TERBORGH

THE nine industrial plants we visited are on the regular tourist circuit, and may therefore be presumed to be above average. On the other hand, they are without exception of prewar vintage. While six of them were demolished during the war and were then restored, the restoration did not make them really new; much less did it bring them up to the best technology of today. Since we had no opportunity to inspect industrial installations of recent or current vintage, no claim can be made that we saw a representative sample or cross section of the productive capacity of the country. My observations are therefore limited strictly to the nine plants visited. They should not be construed as generalizations for Soviet industry as a whole.

Moreover, my training has been entirely in economics, and the casual opportunities that have come my way to observe one sector of American industry in no way qualify me as a production expert. These remarks are therefore the impressions of a layman, not the judgments of an expert.

The nine plants, together with a rounded figure for total employment to give an idea of the size of the operation, follows:

<i>Major Product</i>	<i>City</i>	<i>Total Employment</i>
Lathes	Moscow	6,000
Watches	Moscow	6,500
Candy	Leningrad	1,000
Turbogenerators	Leningrad	10,000
Automatic Lathes	Kiev	3,500
Tractors	Kharkov	32,000
Building Tile	Kharkov	1,600
Hosiery	Kharkov	4,000
Steel	Rustavi	12,000

These enterprises are run by an extremely able group of managers. We had the privilege of talking in most cases with the chief engineer, a figure in the Soviet industrial hierarchy immediately second to the director, and in a few cases with the director himself. These men are obviously highly trained in their profession, intimately familiar with every detail of their operations, and thoroughly practical in their approach. They would be a credit to the management group of any

country. A similar comment applies to the workers. They appear to be extremely industrious, and apply themselves to their tasks with an energy and concentration seldom seen in the United States. This results in part, of course, from the widespread use of piecework and other incentive devices described elsewhere in this special issue of *SR*.

A second observation, one that applies to most of the plants visited, and especially to the machine-building and heavy industry plants, has to do with the crowded condition of the working areas. It appears to be the Soviet practice to jam more equipment into a given floor space than is usual in the United States. The aisles are narrower and are frequently cluttered and sometimes obstructed by work in process, giving limited opportunity for the use of electric lift trucks and other powered materials-handling equipment. It can be said also that the "housekeeping" tends to fall short of American standards. Most of the plants give the impression of being rather dirty as well as crowded, though there are exceptions. Moreover, the illumination frequently appears to be substandard, with resultant fatigue and safety hazards. Safety devices themselves appear to be less prevalent than in this country.

I should say also that most of the equipment appears to be rather old. Since these are either prewar plants or plants restored after the war, this is not particularly surprising. The equipment installed in the restoration was in part new, in part used, and in part transferred from Europe by way of reparations. I have the impression that, with the exception of two or three of the light-industry plants, subsequent installations of new equipment have been on a limited scale.

As is well known, the Soviet Union has an elaborate apparatus of research institutes, design bureaus, and project-planning bureaus attached to various academies, ministries, and government commissions. In addition, most industrial enterprises visited do the design and engineering on their own standard products, leaving more basic research, and the design of special products, to outside institutes and design bureaus.

The lathe plant does the design and development work on its standard lathe,

but gets many of its special machinery designs from the outside. The watch factory does its own design work. The candy factory develops its own recipes. The turbogenerator plant does what it describes as "near-term" design work with its own staff, but has in the plant a branch of the Moscow Design Institute which works on "long-term" design. The automatic lathe plant does its own work on standard products but relies on outside design bureaus for special machinery. The tractor plant develops its own models in collaboration with the Institute for Research in Farm Equipment of the Ministry of Agriculture, which has its own testing stations, and gets new development assignments from the Commission on Automation and Machine Building. The tile plant designs its own tile patterns jointly with ceramic research institutes, relying for the basic research on the Institute of Ceramics Technology in Moscow. The hosiery mill relies on its own designers. The steel mill has a plant laboratory, but relies for research on the Institute of Metallurgy of the Georgian Academy of Science and on the Moscow Institute for Ferrous Metallurgy.

It should be added that the enterprises are not free to adopt new product designs, whether originating in their own organization or outside, without clearance and approval by the industrial control apparatus represented by the *sovmarkhoz* and the republic Gosplan. Proposals to produce new products must be approved, and a price determined, usually for incorporation in the next annual production plan.

It should also be added that management appears to be keenly interested in product development, and is under considerable pressure for such development from the control apparatus. We received several reports that new-product development is scheduled ahead in the one-year and seven-year plans. Moreover, the control authorities have recently introduced a system of incentive rewards for managers, technicians, and others involved in the development and introduction of new designs. The candy factory introduced eleven new recipes last year. The automatic lathe plant reports an average of two major product improvements a year. The hosiery mill is proud of the introduction of an average of five to ten new types of hosiery annually—and so on.

One feature of product design and development that impressed me is the absence of conspicuous improvements over Western models. Indeed, it is noteworthy that several plant managers take evident pride in the claim that their current designs are fully abreast of the best Western models. One gets the impression that the great goal at present

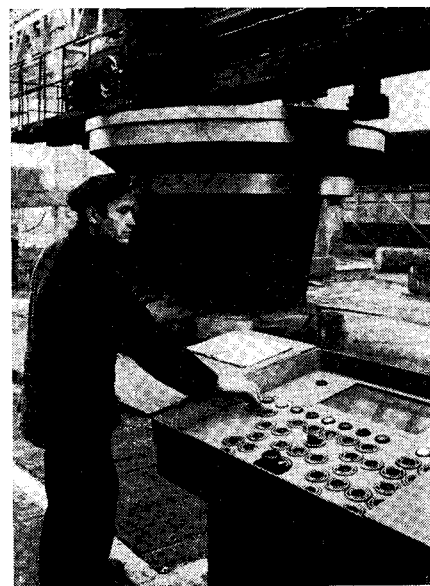
is to catch up with design in the capitalist countries. The only exception noted is the turbogenerator plant, which boasts models of unprecedented size. The plant is now building turbogenerators of 200,000-kilowatt capacity, expects this year to produce a 300,000-kilowatt unit, and is designing units of 500,000 to 600,000 kilowatts, with preliminary work on units of 1,000,000 kilowatts. These are said to go beyond the present horizons of Western design. (American turbogenerator manufacturers consulted on this claim deny it.) In any event, this is the only instance we encountered in which it is even claimed that the products currently produced surpass Western models.

I have the impression that apart from the machine-building plants themselves, comparatively little productive equipment is designed and developed by the user. The machine-building plants, being in the business, do produce a considerable amount of equipment for their own use, but this does not appear to be general. Typically, the design function is divided between the machinery builders and the various research institutes and design bureaus.

IT is fair, I believe, to report the same impression with reference to the design of productive equipment that was mentioned with reference to product design in general. In this area also we encountered several instances of evident pride in the claim that the current Soviet designs are fully abreast of the best Western technology. Again we encountered in only one instance a claim that Soviet designs are significantly superior. This claim concerned the famous automated lines for making standard engine lathes in the Moscow lathe plant.

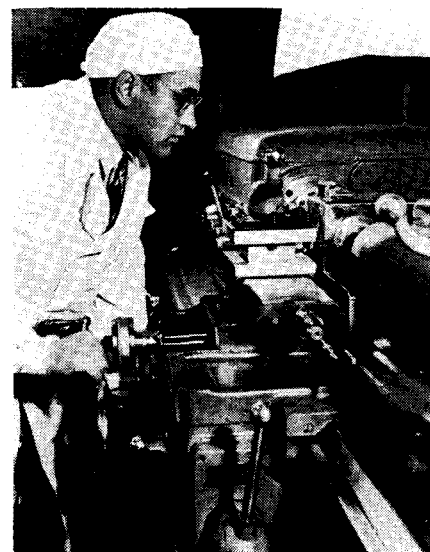
The automation of machine-tool production is undoubtedly a notable achievement of its kind, though it can be questioned whether its over-all advantages exceed its disadvantages. What the plant has done is to use conveyors and equip with special automatic equipment the machining of three major castings, the bed, the gear-box housing, and the tailpiece. It also uses an automatic line for gear-cutting and finishing, as well as a final assembly line with conveyors. By these means it has cut quite drastically the labor requirements of the standard lathe, of which it produces some 12,000 units a year. The claim is made that the direct labor requirement is only a third or less of that of Western countries, where the product is manufactured on a batch or job-lot basis. The lathe is sold for \$3,800 in export markets, which is far below comparative Western prices.

This type of production has of course two disadvantages. First, it requires a

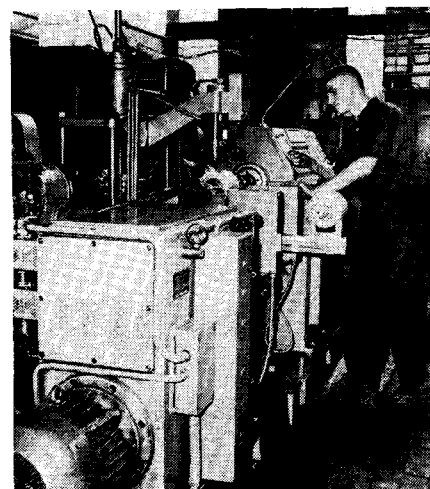


—Photos from Sovfoto

Vertical-lathe operator at Novosibirsk Turbogenerator Plant.



Engineer uses radioactive isotopes to check wearing qualities of tools.



Automatic lathe being tested in Ural electric motor plant.

freezing of product design over long periods and thus impairs the flexibility of development. (The current model was designed in 1957, and may have an extended run in the future.) Second, it is a doubtful service to Soviet industry to feed into it so many units of a simple standard tool, the use of which in Western technology is limited largely to low-production operations. While I am not competent to judge the issue, I have reservations on the over-all advantage. It may well be that the loss to Soviet industrial efficiency from such a mass installation of low-grade equipment will more than offset any economies achieved in its production.

One thing is certain, however. The mass production of this kind of equipment offers tremendous potentials for export to underdeveloped countries. Such equipment is more suitable for their relatively primitive technologies than the more elaborate and sophisticated products of the West, and the low price made possible by volume production gives a decisive advantage. In this aspect of the operation the Soviets are clearly on the right track.

IN the Soviet system the individual state enterprise does not have control of its own capital budget. It is not privileged to "plow back" its own earnings and reserve accruals into new capital facilities. The budget is determined by the planning apparatus, and the enterprise must live within its limits.

This does not mean that the enterprise has nothing to say about the matter. It does submit investment proposals annually, usually to the *sovarkhoz* that supervises it, but the end result is controlled by the basic allocation of investment expenditures in the national plan. This plan allocates capital funds by republics and by industries, and the allocation to the individual plants must stay within the indicated limits.

This means, of course, that national priorities control the capital budget of each enterprise. I have the impression that major emphasis nationally has been concentrated, until recently at least, on the development of new industry and on the expansion of capacity, and that the replacement and modernization of existing facilities have been relatively neglected. While a shift of emphasis seems to be under way now, the long neglect of modernization is reflected in the prevalence of aged equipment.

One of the consequences of this neglect of modernization investment has been a heavy concentration on the rebuilding, rather than retirement and replacement, of existing equipment. I had the impression that such rebuilding is far more prevalent than in the United States. Some plants referred

expressly to their planned rebuilding schedule (for example, the lathe plant programs the rebuilding and modernization of 6 per cent of its equipment annually), with only vague reference to their planned replacement program.

It appears that the overwhelming bulk of this rebuilding occurs in the maintenance shops of the using plant. It is obvious why this should be done by machine-building establishments, but it appears to be common even in consumer goods plants. This creates a sizable auxiliary activity in the maintenance shops.

The recent shift in emphasis from expansion to modernization investment in the Soviet Union has greatly intensified the interest in the problem of investment justification, or, as it is described there, the measurement of "capital effectiveness." I have the impression, however, that up to the present at least, the investigation has been seriously handicapped by certain doctrinal or ideological scruples against an explicit use of interest, or time discount, in investment analysis. This debars the more sophisticated techniques recently developed in the United States, such as the discounted-cash-flow method and others. Soviet theorists have felt impelled to borrow instead from the industrial folklore of the West, and to build on an ancient rule-of-thumb test of investment merit, the payoff period.

Their modification of the version of this device common in the West is to deduct from the estimated annual operating advantage or "saving" of the project an allowance for "capital amortization," and to divide the balance of the saving into the required investment for the payoff period, variously described in their literature as "the capital recoupment," or "the capital redemption" period.

The permissible "capital recoupment period" is not of uniform duration. Elaborate schedules have been prepared describing maximum "recoupment periods" for various kinds of assets, with a very wide range of such maximums from low to high—from two years up to fifteen or sixteen years. This procedure is not only completely unscientific but yields capricious results as tested by any rational system of investment analysis. In time the ideological inhibitions against a more scientific approach will no doubt be overcome.

ANOTHER by-product of the shift of emphasis toward plant modernization is the development of a formal depreciation policy.

One advance in this area has been a belated recognition of obsolescence as a cause of capital consumption, and its inclusion as a cost of production. Until quite recently it was regarded as a phenomenon of capitalist economies of no concern to a socialist system. Now it is recognized, however, along with wear and tear and other forms of physical deterioration, as a legitimate subject for "capital amortization allowances," and such allowances have been increased accordingly.

The question constantly recurs whether depreciation charges in the Soviet Union are higher or lower than they are for the corresponding industries in the United States. It is impossible to answer this question definitely on the basis of our limited observation. In the first place, Soviet asset valuations have recently been translated from historical cost to its current equivalent, and depreciation rates are now computed on the adjusted valuations, in contrast to the practice in this country. In the second place, depreciation allowances in the Soviet Union are in-

THE SOVIET BLOC IN THE WORLD ECONOMY (1959)

Indicator	Unit	World	Soviet Bloc	USSR	Industrial West	USA
Population	Millions	2,905	1,010	210	544	177
Electric Power	Billion Kilowatts	2,058	418	264	1,385	794
Energy Consumption Total	Million MT*	3,983	1,122	621	2,399	1,402
Per Capita	Metric tons*		1.15	3.0	4.5	8.1
Steel	"	291	92.5	60	184	85
Petroleum	"	977	149	130	387	348
Trucks	Thousands	2,929	450	371	2,186	1,136
Passenger Cars	"	10,526	244	125	10,106	5,591

*in terms of hard coal equivalent

**Eastern Europe, USSR, Red China, and satellites of Red China

***Western Europe, British Isles, Canada, and USA

Source: Indicators of Economic Strength, Department of State

clusive of what are known as "capital repairs." This term appears to cover heavy maintenance, including rebuilding and renewal expenditures. Since these "capital repairs" are charged against the current depreciation allowance, and since the practice in the United States, while by no means uniform, is generally different, this complicates any comparison of depreciation rates.

We were able to obtain the over-all depreciation rates (for plant and equipment combined) for five of the industrial enterprises visited. They range from 5 to 7 per cent, with an average of 5.7 per cent. Inquiries in several plants indicate that from a third to half of the allowance is absorbed by "capital repairs," leaving an average rate for depreciation proper somewhere between 3 and 4 per cent. This appears to be below the average for the United States, even if depreciation is computed on the current equivalent of the historical cost of capital assets.

I HAVE mentioned that Soviet industrial plants appear to manufacture in their own maintenance shops a considerable portion of the repair parts required for their equipment. The reason for this lies in part in the remote relations between equipment producers and their customers. With the exception of the tractor plant, which manufactures equipment chiefly for agricultural use, the machine-building plants visited maintain no regional warehouses for supplying repair parts to their customers. All shipments of such parts are made from the home plant. This means that the customers must protect their requirements by having a large bank of parts on hand, and that in emergencies they must manufacture their own rather than wait for a remote shipment. This probably results in larger aggregate inventories of repair parts for the economy as a whole, and more delays and interruptions in production, than are required by our system, in which the supplier usually maintains a regional bank of parts for quick service.

It is not only with respect to repair parts that the relations between the machinery supplier and his customers are remote. Again excepting the tractor plant, none of the machine-building establishments maintains regional sales and service offices. This means that the close and cooperative relations between the supplier and customer common in the United States are not enjoyed in the Soviet Union. Not only is machinery bought rather than sold; there also appears to be less in the way of collaborative solution of customer production problems, so fruitful a source of technological progress in our country.

The USSR's Organization Men



—Sovfoto

Moscow University Nuclear Physics Institute—Feader S. Vasiljer (center) discusses next cyclotron experiment with a group of workers.

By FLOYD A. BOND

WHO ARE the top managers in the Soviet Union? How are they selected, trained, and motivated to become ideal organization men in the most bureaucratic of all societies? What are their special problems and how do they go about solving them?

On the bottom rung of the Soviet management ladder are the plant managers, who are roughly comparable to plant superintendents in our system. Almost all of them are men, even though women make up 45 per cent of the labor force and receive about a quarter of the engineering degrees. They are relatively young men; almost all hold college degrees; and most degrees are in engineering from technical institutes. Their primary responsibility is production.

On the ladder above the plant managers are the top administrators in the 100-plus regional economic councils (*sovnarkhozy*). Each council is, in a sense, the "home office" for the factories doing about 85 per cent of the industrial production within its region. Some rough idea of the responsibility the chairmen of these councils have can be gained by imagining 85 per cent of all U.S. industrial production concentrated in 110 corporations.

On the ladder above these adminis-

trators are the chief planners in the Gosplans and the members of the Councils of Ministers.

At the very top of the ladder are the members of the all-powerful Central Committee of the Communist Party. The Party, as is well known, commands the complete loyalty of all of its members. These include almost everyone on the ladder with the possible exception of a few managers on the bottom rung—a fact that should never be forgotten in discussing Soviet management.

To gain a foothold on the management ladder, one should be a college graduate, a member of the Communist Party, and (as a general rule, but not necessarily) a male.

THE route to the top is much less varied than in the United States. The better grades one has received in college, the more likely he is to have at least some influence on the choice of locality, perhaps even the factory, in which he begins his career. The more he has distinguished himself in the Young Pioneers and the Young Communist League, the sooner he is likely to become a member of the Communist Party. And the better he knows and is liked by the powers that be, the quicker he will rise.

The usual route to plant manager is