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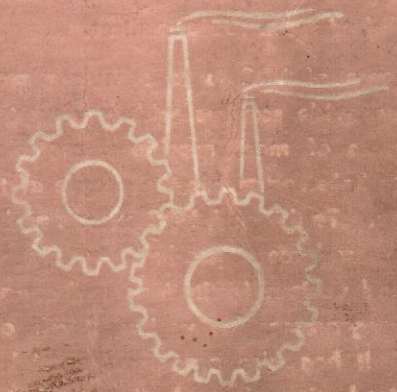

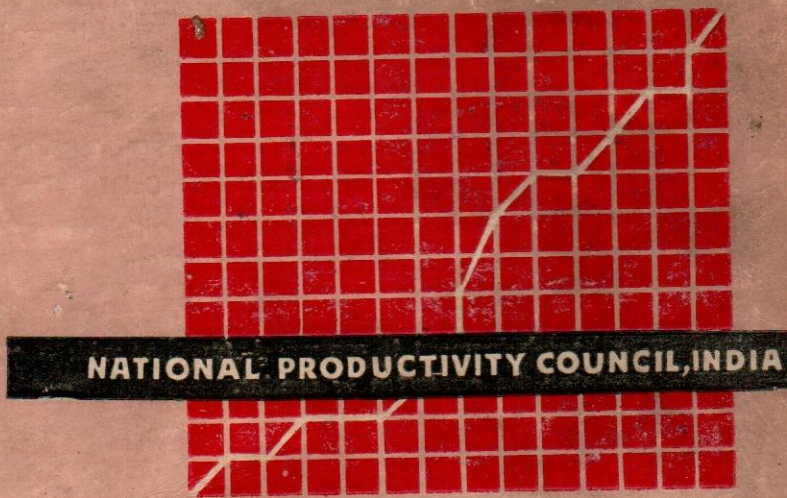

NATIONAL PRODUCTIVITY COUNCIL, INDIA

NATIONAL PRODUCTIVITY COUNCIL

The National Productivity Council is an autonomous organisation registered as a Society. Representatives of Government, employers, workers and various other interests participate in its working. Established in 1958, the Council conducts its activities in collaboration with institutions and organisations interested in the Productivity drive. Local Productivity Councils have been and are being established in industrial centres.

The purpose of NPC is to stimulate productivity consciousness in the country and to provide services with a view to maximising the utilisation of available resources of men, machines, materials and power; to wage war against waste; to help secure for the people of the country a better and higher standard of living. To this end, NPC collects and disseminates information about techniques and procedures of productivity. In collaboration with Local Productivity Councils and various institutions and organisations it organises and conducts training programmes for various levels of management in the subjects of productivity. It has also organised an Advisory Service for industries to facilitate the introduction of productivity techniques.

NPC publications include pamphlets, leaflets and Reports of Productivity Teams. NPC utilises audio-visual media of films, radio and exhibitions for propagating the concept and techniques of productivity. Through these media NPC seeks to carry the message of productivity and to create the appropriate climate for increasing national productivity. This Journal is an effort in the same direction.

The Journal bears a nominal price of Rs. 1.50 per issue and is available at all NPC offices. Annual subscription (Rs. 9.00 to be sent by cheque in favour of National Productivity Council, New Delhi) is inclusive of postage !

Opinions expressed in signed articles are those of the authors and do not necessarily reflect the views of NPC.

* This issue begins from page 187, as the pages of the preceding issues have been consecutively re-numbered, beginning from Vol. 1, Number 1. Vol. 1, Number 2 will now bear page numbers from 63 to 120, and Vol. 1, Number 3, from 121 to 186.

"... To hell with the man who cannot walk fast... We want no sluggards. We want no slow people who always complain... I want men who work as crusaders... Can you conceive of a bigger thing than to build up this immense country of ours?... let the weak and the slow and lazy go to the wall...

"... I want all people, whether engineers or non-engineers, to possess an engineering approach to the problems facing them... The engineering approach would be a scientific approach coupled with the urge for creation, the urge to make and produce new things for the common good....

"... our approach is always a pragmatic approach—how to get things done... if... there is a way of doing it effectively and quickly...

"... We are anxious to compare the working of the private and public sectors in particular industries. We want each one of them to push the other to better performance. We want an element of competition to see that each does better..."

Jawaharlal Nehru

Importance of Time in Productivity

NOW that the Productivity Movement is on the rails, it is time to enquire as to the essence of what is being carried. The thesis here presented is that the element of time constitutes the *raison d'etre* of productivity.

The popular idea about productivity, which is not far from wrong, is the practising of some economy of resources in relation to given ends. For example, India wants to accomplish in 10 years what other nations have accomplished in 100 years. This really means that we must so economise time as to be able to carry out within 10 years a full scale industrial revolution which began in the United Kingdom in the 18th century, the United States in the early 19th century, Germany, the late 19th century and Japan, the early 20th century. Obviously the most important resource that we have to economise is time.

Wars furnish extremely significant examples of how time constitutes the most essential element in an economy. In war, a certain end has to be accomplished in a given period of time whatever the expenditure of other resources; and often it proves that an end accomplished in the shortest possible time means a considerable economy in terms of other resources. Time is the most important resource to be gained or saved. It saves the destruction of material resources on either side and also the slaughter of human lives.

This has a lesson for us: when we want to construct thousands of schools and other buildings in a short time so that our children should have at least some place to sit in, and men and women in general should have some roof on their heads, for good sized brick-steel houses for a population of more than 300 million would take decades to construct and in the meanwhile children would go without education and men in general without the elementary comforts of life.

Generalising, any significant increase in the standard of life in the shortest possible period, as desired by the mass of the people, can only be brought about by some such productivity techniques, that lead to the economising of time; and if people do experience some significant increase in the standard of living in a reasonably short time, their cooperation in the long term economic programme would be forthcoming in a measure, not yet experienced.

To some extent, productivity experts have themselves acknowledged that time constitutes the essential element in productivity. In fact, the first instrument that the productivity expert asks for is the stop watch. Work study, time and motion study, methods study—all really mean the economising of time. As Mr. R N Currie's article, published in this issue, shows, the theory of work study is now being applied to offices, to the armed forces and to hospitals so that government officers, army people, doctors should

be able to do their existing tasks in shorter time in order to make them available for a larger quantum of services that the community is asking for.

Work study can with great advantage be applied to the home, where the largest consumption of resources takes place. In fact, a work study of the daily routine of a housewife might practically mean the liberation of women from fatigue and irritation to which they are constantly subjected at least in the countries of Asia. It would mean that women would be able to do their home tasks in shorter time and pleasanter surroundings and their time would be available for cultural development. Thus electric washing machines, electric cookers, vacuum cleaners are all apparatus of productivity for the housewife.

To take the same example as the President of NPC has taken in the article that follows: that of a trained engineer and an untrained man both trying to construct a bridge, the difference between them being that the cost of constructing a bridge by the trained engineer would be much less than one constructed by an untrained man. Actually, the cost works out in terms of time: an untrained man, given the same quantum of resources, would take a much longer time to get the bridge constructed than an untrained man would. Palaces, bridges and canals were also constructed in the old times but they took decades to build, though the masters at that time had absolute control over resources. It took the Pharaohs of Egypt 10 years with 50,000 men to build the famous pyramids. 22,000 men were employed for 22 years to build the Taj Mahal. These figures may not be accurate but they do give, correctly and significantly, the order of magnitude involved. On the other hand, one of the biggest dams in the world, involving a larger volume of masonry work than the pyramids and the Taj, has taken not more than 3 years to complete with the assistance of 2,500 persons. The modern economy has become a more productive economy in the sense that much more can be accomplished in shorter time than it used to take; and the economy becomes progressively more productive as the same job takes less and less time.

All productivity techniques are essentially techniques for economising time. Plant layout designers use modern techniques to see that men and materials pass through to destined ends in the shortest possible time; that unnecessary movements backwards and forwards are eliminated so that the time saved may be devoted to the maximisation of output. Plant layout has, or course, other subsidiary, though socially more important ends: that the health of the workers is not adversely affected and that they have reasonable facilities and can work in fair amount of comfort. Of course, it is possible to demonstrate that even in these respects, time is the most important factor, but it is really not necessary to do so. It may for example be proved that with better lighting the workers can do the same work in less time and so on.

Similarly it can be shown that the objective of every productivity technique such as production planning, cost control, materials handling, machine utilisation etc. have as their real principal objective the saving of time so that more work could be turned out in a given period.

Probably the analysis could be best illustrated from two of the principal functions of a productivity organisation: the enhancement of

efficiency of management and the productivity of labour. One of our principal programmes is management training. The idea underlying this is that managers should be able to take right decisions quickly. Managerial ability being short and trained managerial ability being particularly short, the resources in terms of management have to be distributed in such a manner and so intensively used that we are able to build up and manage a big scale economy in the shortest possible time. A big steel concern involving a very large chunk of investment and employing thousands of workers must have a manager whose mind is trained to work like a photographic camera, for while the blast furnace burns and molten metal flows down, every minute is costly.

Labour productivity about which there is so much controversy, also means that labour should be able to do in less time what it is doing at the moment or what comes to the same thing, turn out a larger quantum of work in the same time. If this is achieved, as it must be, labour has to be assured that the gain in time would work to the advantage of the working class as a whole (in terms of employment and share of national income), to the immediate advantage of the labour force of which the individual worker is a part and directly to the individual worker himself. The anomaly by which labour is not interested in the enhancement of its own productivity lies in the lack of a straightforward analysis of the whole problem of productivity. Productivity essentially means the saving of time; and time cannot be saved, unless the persons involved are psychologically interested in the saving of that time. They will not be so interested unless it works to their advantage and the advantage of their class. Socially speaking, therefore, labour productivity has the best chance in a full employment, fair wage economy. It is in such an economy that people accomplish in a fraction of time what we take days to get through. We have therefore to build up

It is in this context that the advice of the NPC President becomes significant: "On one thing I should be unequivocally clear, both as Minister of Industry of the Central Government and the President of the National Productivity Council, that the first and prior claim of increased productivity must be higher remuneration for labour. We must write this in our industrial code and make it clear both by words and deeds that the gains of higher productivity must be primarily devoted to raising the remuneration of labour to a fair wage level." If this policy becomes a reality, the NPC President's advice that "we do in nine hours what we were doing in ten" becomes "a practical possibility. Practically all of us can do in half the time what we are doing at the moment." *Time is the essence of Productivity.*

a system of incentives so that the mass of the people should acquire a direct and personal interest in the economy of time

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Importance of Industrial Productivity

MANUBHAI SHAH*

Nations live as they produce. The logic of economic welfare compels the most productive use of resources. Acceleration of economic development depends on how productive we are in our application of labour and capital. An increase in production by a lateral expansion of productive facilities will certainly contribute towards increasing the volume of output but the hidden diseconomies in such an approach will weaken the system and create an imbalance in the economy. In this context the productivity drive has a role to play, as supplying the vital element that will not only energize a historically lethargic system but raise it to a higher level of economic well-being.

THE concept of Productivity has been varyingly explained as an attitude of mind, a continuous effort towards progress, the certainty of being able to do better today than yesterday, a constant adaptation of economic and social life to changing conditions, and so on. These are obvious truths, but they have to be emphasized because the future of our country depends on the discovery and application of new techniques, ideas and methods.

Productivity literally implies an economizing of means in relation to given ends. Increased productivity means producing more with less capital, less raw material, less physical effort and in shorter working hours. Productivity is also a measure of technical progress. For example, the efforts made by copy clerks to improve their output was outstripped by Gutenberg's invention of printing. Increased productivity should mean not only an economical use of existing resources but also the development of new resources and their exploitation with the minimum outlay in order to cover the largest possible area of social development in the shortest possible time. Psychologically, it involves allaying fears, overcoming hesitations, breaking with the routine; in short, creating a new mentality, an attitude of dynamic expansion throughout the structure of the community. The means employed should include the adaptation of our education to the needs of a modern economy, the development of applied research and the fostering of a spirit of cooperation and understanding between employers, technicians and workers and their unions. The basic thinking in industry today has to be reoriented towards increasing productivity.

A realisation is now coming that the economic problem in India cannot be solved except through the adoption of productivity techniques. Our natural resources, once believed to be inexhaustible, are now found to be deficient in certain material respects. Further, these natural resources have to be surveyed and located; and a large amount of capital is required for their efficient exploitation. The whole problem has again to be viewed in the context of a general scarcity of capital and trained manpower. Much depends on our doing things fairly speedily: Time being money, in the context of our problems in India, it is of the utmost im-

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portance that we make the most productive use of it.

When we began our first Plan, we had to provide for a population of around 350 million. Now we are more than 400 million. It is only too obvious that this race can only be won through the rapid evolution and determined application of productivity techniques, appropriate to the social and economic environment in India. If we wait for substantial savings to materialise in an economy characterised by deficiency in the very means of subsistence and the large mass of the people compelled to spend whatever they can possibly earn, the take-off of the economy into a position of self-sustained growth would be indefinitely put off. With the increasing population and vastness of economic poverty among the masses, there is compulsion of the most vital historical character to organise as early as we can the most productive utilisation of our resources.

The competition for resources is, in fact, becoming so acute that productivity would have to be given the highest priority in economic planning. People want resources to be urgently devoted to raising their standards of living. The community is calling out for more schools, hospitals and other social services, including modern housing and sanitary arrangements for a population of over 400 million growing at nearly 2% per annum. The State, naturally interested in building a strong base for the economy, is immediately organising the construction of steel plants, irrigation systems and the like. This increasing pressure on resources puts manufacturing industries into a tighter corner and is most likely to leave the vital small industry sector with none too adequate resources.

The only economic solution, therefore, if we are to avoid inflation is to multiply our resources through more and more productive uses. Deficit financing has been talked of but we experimented in it at the beginning of the Second Plan with consequences with which we are by now all familiar. It needs to be repeated that the printing press does not generate power, nor does it produce steel. Bridges are not built by currency notes but by men trained in the art of constructing them. In this connection I may be permitted to quote an old saying that the difference between an untrained person and an engineer is that while the untrained person requires several crores of rupees for constructing a bridge, an engineer can do it at much less cost. Thus the very principle of construction contains the idea of productivity. Can we construct all these bridges except through a more productive utilization of resources, to take only just one example?

I have not so far referred to the tough problem of foreign exchange. We have nearly utilised our sterling balances and what remains is just sufficient for normal requirements and emergencies. With a large and growing population and internal resources fully mobilised for priority needs, it would be too much to count on the emergence of large and substantial export surpluses. Further, inflationary pressure, normal to a developing economy, is naturally making our exports less competitive than they would otherwise be. Foreign resources have, therefore, to be borrowed on long term credits. Our Prime Minister has rightly insisted for long that the less we depend upon foreign assistance, the better would it be for the country from every point of view. We have thus to rely very largely on internal resources for our development needs, which enhances the importance of productivity as a tool for mobilisation.

The shortage of capital is by no means the only difficulty in our economy. The quality and skill of our manpower, which are still to be developed, are the root causes of many problems. There is need for education and

technical training in as short a period as possible. Thus education needs to be productivity-oriented, if we are to develop into good and healthy citizens, capable of taking care of our country and contributing our best to social and economic development.

While organising an investment programme for industry it should be an integral part of the Plan, to aim at the maximum productivity of labour, machinery and other capital goods, in which we propose to invest. In the First Five Year Plan, the outlay on industry was about Rs. 180 crores. This was increased to Rs. 800 crores for the second Plan, and it would be much larger for the Third Five Year Plan, beginning in 1961. Taking the Second Five Year Plan outlay of Rs. 800 crores on industry, a 10% rise in the productivity of this investment would mean a saving of Rs. 80 crores. A 10% increase in productivity is modest, for it simply means, for example, that we do in 9 hours what we were doing in 10. That, as every one knows, is a practical possibility. *Practically all of us can do in half the time what we are doing at the moment.* The silver lining to the situation, if it could be so called, is that almost extra-ordinary increases in productivity could be achieved practically in no time at no cost, with almost everybody better off than before. We have only to turn our faces to the Sun to see the light.

The essential purpose of the productivity drive is to drive home the truth enunciated above. We have to use modern management and industrial engineering methods. We have to assimilate the techniques of scientific management and human relations. Improved management is, in fact, the most important element in our productivity movement. Management has, on the one hand, to secure cooperation of all the factors of production and on the other hand to absorb modern productivity techniques, such as work and methods study, incentive schemes, grievance procedures, joint consultation and the like.

We want to become a prosperous nation, and that too rapidly. But prosperity will not descend upon us. We have to take the hard road and go forward at faster and faster pace. The progress of really prosperous nations has been preceded by tremendous efforts to increase productivity by all means, the development of science and technology, research into methods, improvement in management and labour relations. The American economy is able to offer more than 60 million jobs, and to its ordinary workers, facilities like motor cars, refrigerators, electric washing machines and the like, because it is more productive than many economies. There has been a four times increase in American as compared to British industry, in mining and railway transport, and twice as much in public utilities and communications. That explains why the standard of living in the USA is much higher. The British and the Japanese have a much higher standard of living than we have, because they are much more productive, and continuously becoming more so. There has been a constant urge on their part to look forward to improvement, to pursue research, to change over to better technology and adopt every method that contributes to higher productivity. The parallel development in the field of education has resulted in the growth of facilities in industrial engineering, industrial relations, management, and productivity specialisation. The notable features in their industrial units are the industrial engineering departments and the continuous application of work and methods study, cost control and other productivity techniques.

The lesson is plain: the concept of higher productivity has penetrated every aspect of the British, Japanese, German, Russian and American public life—their industry, agriculture, armed

forces, communications, transport, administration and their working class.

So far as we are concerned, we have to realise that our productivity is low. We need a diagnosis of the causes of this low productivity in Indian industry. Why do our workers and capital equipment have low productivity? Why is it that the Japanese worker can attend to 6 times the number of looms that the Indian worker attends to? How is it that the American worker produces thrice as much in the same time as an Indian worker? We have, as I said earlier, to understand and remedy the general inability of Indian capital and labour to produce comparably with other nations from out of existing resources.

But a break has now been made and if we continue and intensify our productivity drive, it should be possible to develop the economy to a somewhat comparable state of productivity. In the meanwhile, both management and labour have to search their own hearts and develop an active attitude towards modern technology, both in mechanical as also in human terms.

There is a general tendency to blame rising wages and attribute higher costs to the rising wage-level. This attitude is anti-social. By all standards, wages are low in India and need to be raised to give the workers a tolerable standard of living. But in order to earn higher wages, we must have higher labour productivity, for unless we have a larger cake, we shall not get larger slices. The vicious circle of low wages and low productivity has got to be broken.

We need the new type of engineer, called the productivity expert. His work study, and incentive schemes based on the results of that work study, are the new methods by which we can raise the productivity of labour, and along with that, their real wages. On one thing I should be unequivocally clear, both as Minister of Industry of the Central Government and the President of the National Productivity Council, that the first and prior claim of increased productivity must be higher remuneration for labour. We must write this in our industrial code and make it clear both by words and deeds that the gains of higher productivity must be primarily devoted to raising the remuneration of labour to a fair wage level. The consumer, by way of reduction in prices or holding on to a reasonable price line, must be close second in sharing the gains of productivity. The industry will undoubtedly reap the benefit of both these gains and much more, the consequential benefits of development and production. It is only that way that a dynamic economy will come into being. To me, rapid progress and productivity are synonymous. For a country like ours, productivity is the most potent weapon and source of massive development.

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At a certain lecture meeting, a *naive* appeal from a minor enterprise labourer was heard to the following effect: "My employer does not give us wages and bonuses, simply saying his business has a deficit. If he would ever try to explain to us the reason for the deficit, and how large it is, we would never spare our efforts to solve the problem in cooperating with him."

From Guide Book for Productivity Drive published by Japan Productivity Centre.

Soviet Productivity and Technical Training

H ZELENKO*

It is now universally realized that productivity of the Soviet industrial system is largely due to their arrangements for vocational training. This article describes the organisation of vocational training in the Soviet Union and the fundamental principles on which it is based. Although the majority of young skilled workers are trained in special institutions of various kinds, theoretical instruction is in all cases blended with a large proportion of practical work and students even spend hours working under actual production conditions; this link between school and industrial life is to be further strengthened under a recently introduced educational reform. On the other hand the many semi-skilled workers on the job in factories or on construction sites receive the necessary minimum of theoretical instruction. At present technical training in the Soviet Union is mainly given at permanent government vocational institutions. Apart from these, there are many instances of accelerated training of various kinds, during which trainees can continue full-time or part-time employment.

IN Tsarist Russia three-quarters of the population were illiterate and about four-fifths of the children and adolescents did not go to school. Education was at a particularly low standard among the eastern peoples: in what are now the Kirgiz, Uzbek and Turkmen Republics, the number of persons who could read and write ranged from 1 to 3 per cent. Out of the Empire's 71 languages, 48 had not been reduced to an alphabet at all. Throughout the whole country there were less than 200,000 professional men and women with secondary and higher education.

In what must be described, in terms of history, as an extremely short period, the Soviet State abolished cultural backwardness. Illiteracy has long since been wiped out. The number of pupils in the higher classes of the general schools is now almost 40 times as great as it was before the Revolution. Over 4 million young people attend the universities, high-schools and special secondary schools. *In the Soviet Union every fourth person is a student of some kind.*

Great attention is paid also to vocational training of both juveniles and adults. Back in 1918, compulsory education was introduced for persons aged 15 to 17 years employed in factories and offices. In 1920, Lenin signed a decree which made vocational or technical training compulsory for all manual workers, aged 18 to 40, with the sole exception of those who had received vocational training not inferior to that of the former trade schools or had studied at technical institutions. At the same time, factory training schools (FTS) were established for young workers in many industrial undertakings; these played an outstanding part in the development of Soviet vocational and techni-

* Chairman of the State Vocational and Technical Training Committee of the USSR Council of Ministers.

cal training. Combining classes and productive employment, general study and vocational instruction, bringing in physical, moral and aesthetic training also, the FTS were able to turn out skilled workers with general as well as technical education.

As the national economy of the Soviet Union developed, the vocational training system was progressively improved and modified. In particular it became clear in 1940 that the FTS, hitherto the principal means of turning juveniles into skilled workers, were no longer doing an adequate job. They were training personnel for a narrow group of trades and only for the particular establishment concerned. In consequence the new factories, mines and building sites that were then being opened on a very large scale, as well as existing undertakings which had no schools of their own, were obliged to train their personnel as best they could.

The system of vocational training institutions and state manpower reserve schools set up in 1940 was intended to make good this serious shortcoming. Unlike the FTS, the manpower reserve schools train the skilled workers needed, in accordance with co-ordinated national economic plans, by all undertakings, building sites and other employment units in the country. Among vocational training institutions the system of manpower reserve schools has the most important place. Basically homogeneous, the system now includes institutions of various types which differ according to the level of skill to be acquired by the students, the industry for which they are to be trained and the level of their general education, as well as their age and other characteristics.

In many industries the manual workers are divided into three skill groups: low, medium and high. Two types of institutions train workers in the lowest group—industrial schools and mining schools. The former train workers who will perform either one repetitive operation only or various simple operations, as well as some groups of auxiliary workers; they usually offer a six-month training course and are attended by lads and girls of 16 to 18 years. The mining schools train production workers for coal and ore-mining; because of the special character of underground work the training period in this case is somewhat longer (ten months), and the schools are attended by boys only, aged 17 to 19.

There are several types of institutions for "medium-skilled" workers. They include industrial, mining, railway and building colleges. The industrial colleges train workers of this class for metal production, all kinds of engineering and the metal trades, other processing industries, communications, printing, etc. The types of occupation for which the other colleges mentioned train workers are obvious from their titles. The length of courses in all these colleges is from two to three years, according to the complexity of the trade. They are attended by boys of 14 to 17 and girls of 15 to 17 years of age, mostly after at least seven years in general (primary-secondary) education.

Technical progress in the Soviet Union has led to a fall in the demand for low-skilled workers and to a corresponding rise in the percentage of employment in the medium and higher grades. As a result the industrial and similar colleges have been training more young persons and the importance of the industrial and mining schools giving a shorter course has been diminishing. For instance the majority of metallurgical and metal trade workers were formerly trained in industrial schools, but now they go to industrial colleges. Until recently workers for the basic trades in the building industry went to construction schools for six to ten months; now they are trained at construction colleges with a two-year course.

Colleges of agricultural mechanics are another important type of training institution. They train skilled workers to operate, maintain and repair the machinery used in the cultivation and harvesting of farm products and in stock raising. The courses last from six months to two years and are attended by lads and girls of 17 years and upwards, most of whom have had seven years of general education. As Soviet agriculture is supplied with more and more new and improved machinery, fewer trainees are taking the six-month course and already most of them are enrolled in the 18-month or two-year courses.

In 1954 a new kind of vocational school was introduced in the Soviet Union in connection with the wide expansion of secondary education in the last few years. Anyone who has finished secondary school (i.e. completed the ten-year general school course) and who wants to go into productive employment can go to this special new institution—the technical institute—which turns out highly skilled workers in trades requiring an advanced level of education, or junior technicians, after courses lasting one or two years.

Among full-time vocational training institutions for young people mention must be made of special vocational and technical colleges for orphans. Their chief distinguishing feature—apart from the outstanding material conditions provided—is that the pupils receive not only vocational education and training but also systematic general education.

Finally, the educational system includes 12-year vocational and technical colleges which give a broad polytechnical training with both general and specialised secondary education. The curriculum is framed in such a way that graduates are prepared for a wide range of occupations and so can choose the one that attracts them most. Moreover, in order to continue and complete their education, they can, when necessary, easily transfer to another similar institution with a curriculum better suited to their tastes and aptitudes.

Attendance at all kinds of vocational schools is free of charge and the students receive books and other educational requirements from the Government, as well as full board, uniform and shoes, or an allowance instead. Students from rural districts and those coming from other towns are housed in well-equipped hostels. In addition, all students receive between one-third and one-half of the money paid to the school for the work they do in course of practical instruction at undertakings or in school workshops.

The above brief outline gives some idea of the various types of schools in the state manpower reserve training system of the Soviet Union. There are some 3,200 of these schools, which every year *train upto 1 million skilled workers for the various branches of the economy.*

Very large amounts are provided annually from the state budget for the maintenance of these schools. In addition, undertakings attached to them give the schools systematic material assistance, providing them with repairs to buildings, etc. Considerable sums are also spent each year on the construction of new vocational schools.

Alongside the manpower reserve system there are also many vocational schools operated by undertakings, chiefly in the light and food industries, on the same lines as the manpower reserve schools; 800 of these factory training schools prepare an annual average of 100,000 skilled workers for their respective undertakings.

The curricula at the various kinds of vocational training establishment are fixed in the light of the *general aims*

of the schools, the manpower needs of the economy and the level of general education of the students. Let us look, for instance, at the curriculum for the training of coalminers who are to work in horizontal or inclined seams by the advancing system (two-year course at a mining college).

Subject	No of hours
1. Practice on the job	1,856
2. Safety technique	64
3. Special technology	267
4. General study of mining	90
5. Mining electro-technics	147
6. Study of materials to be used	80
7. Mechanical drawing	80
8. Elements of applied mechanics	140
9. Mathematics	80
10. General education	140
11. Physical training	140
12. Examinations	42
	3,126

As this schedule shows, practical instruction is the largest item in a coalminer's training, as in that of any other worker; this practical part of the course is analysed in greater detail below, but first let us take a look at the theoretical items.

In order to work successfully in a modern undertaking, the Soviet worker must have a thorough knowledge of various subjects, both general and special or technical. He must understand the physical and chemical background of production processes and be familiar with the complex kinematics of machinery and with the action of various types of electrical and hydraulic apparatus. He must be able to read plans and understand the composition and qualities of materials; he must *know his way about in economics, industrial organisation, etc.* How is all this knowledge to be acquired?

The above curriculum is intended for young persons who have had seven years general education and have acquired a sufficiently extensive, indeed a fairly complete, fund of knowledge on general subjects. Accordingly, the theoretical instruction at the mining college includes seven technical subjects, together with mathematics, general culture and physical education. The technical subjects are chosen having regard to the student's future job, but students studying for any occupation at this type of institution have to take a prescribed amount of special technology, general technology, mechanical drawing, elements of applied mechanics and elements of electro-technics.

The mathematical curriculum contains several supplementary sections which are required for the study of certain technical subjects. Provision is made for the elementary physics required for the courses on basic applied mechanics and mining electro-technics. If the trade studied were to belong to the chemical or metallurgical industry, chemistry too would figure in the curriculum. As for general education and physical training, these appear in all the curricula because of their prime importance for the all-round development of the young.

It should be borne in mind that the curriculum of each institution sets out only the compulsory subjects studied by the group. Apart from these, students at vocational schools of all types do a great deal of extra-curricular work aimed at broadening their technical knowledge and attaining all-round cultural and physical development.

The following study schedule for coal-mining students on horizontal and inclined seams worked by the advancing system is typical of the structure of

practical instruction in a vocational training college:

FIRST YEAR

First Quarter	No. of hours
1. Getting to know the pit ..	18
2. Getting to know the training workshops; safety rules in the training workshops ..	6
3. Instruction in general fitters' work (180 hours in all)	72
Tests	12
	108
Second Quarter	
3. Instruction in general fitters' work (concl.)	103
4. Instruction in electrical fitting (60 hours in all)	24
Tests	12
	144
Third Quarter	
4. Instruction in electrical fitting (concl.)	36
5. Instruction in assembling and stripping advancing-system machines; basic practice in their operation	160
Tests	12
	208
Fourth Quarter	
6. Instruction in repair and maintenance of advancing-system machines	184
7. Instruction at the timber store	36
Tests	12
	232
Total for first year	692

SECOND YEAR

First Quarter	
8. Instruction in advancing-system methods (horizontal and inclined seams) (486 hours in all) ..	186
Tests	12
	198
Second Quarter	
8. Instruction in advancing-system methods (cont.)	180
Tests	12
	192
Third Quarter	
8. Instruction in advancing-system methods (concl.)	120
9. Instruction in the use of conveyors, pumps and ventilators; operation of drilling and cutting machines and advancing-system combines (240 hours in all) ..	180
Tests	12
	312
Fourth Quarter	
9. Instruction in the use of conveyors, pumps, etc. (concl.) ..	60
10. Work at actual workplaces ..	366
Passing-out examinations ..	36
	462
Total for second year	1,164
Over-all total for two years	1,856

The above plan shows how carefully instruction in the school and pit workshops, the timber store, the school mine workings and at a real work-place is integrated into a single programme and how the contents of the course are articulated and combined. Thus, general fitting, electrical fitting and woodwork appear as separate subjects. The assembling and stripping of advancing-system machines and basic practice in their operation are also studied as a separate subject because of the complexity and variety of the machines and the character of conditions underground (in similar cases with less complexity the two matters would not constitute a special subject). Subsequently, the students are instructed in the maintenance and repair of these machines.

Instruction in the advancing-system methods themselves takes an important

place in the programme. In a planned progression from one work-place to another the students carefully familiarise themselves with the drilling of leads, the mechanical transport of coal and rock, the working of the coal and rock loading machines, the fitting and repair of props and roof, the clearing of roads, and the operation of conveyors, drills, coal-cutters and combines.

In order to complete their programme the students carry out the whole complex of advancing-system operations at a real workplace, learning from the experience of the most efficient miners of the area and getting to know the established production standards.

The programme as a whole, like each of its parts, is put together so as to proceed from the simple to the complex and is the result of years of creative research by Soviet vocational training specialists. Instruction starts with study of individual operations; when each group of not more than three operations has been mastered, complex work involving the operations already studied is introduced; the proportion of complex work, and its level, are steadily increased; and instruction ends with the student performing all the tasks involved in the occupation concerned in the very circumstances that will face him when he is a qualified skilled worker.

It is not difficult to see that such a system creates the best possible conditions for thorough, systematic, effective and appropriate instruction, a proper balance between theory and practice, and implementation of the various educational principles worked out by Soviet specialists in this field.

Efficient material arrangements—premises and equipment—are an important factor in all educational work. At the Soviet vocational and technical schools and colleges, the students work in classrooms, school laboratories and workshops, in special areas reserved for the study of heavy machinery, and in the training sections of factories, laboratories and warehouses.

Classrooms are provided for each subject taught and for each speciality. In individual cases, however, if there is little work to be done on a given subject the rooms for two related subjects or specialities may be combined. Classrooms are equipped with everything necessary for the various kinds of instruction, with a full range of visual aids, and with material for extra-curricular work; they contain samples of raw materials, industrial materials or products in various stages of processing, tools and measuring instruments, machinery, models, textual posters, photoposters, diagrams, graphs, blueprints, technological and instructional charts, slides, instructional films and film strips, and various kinds of instructional and auxiliary literature. They also have the necessary furniture and equipment for students and teachers—lockers, shelves, stands, desks, projection apparatus and screens (ordinary and daylight).

School laboratories are provided for chemistry, electrotechnics, study of machinery for certain trades, etc. All these have well-equipped workplaces with the appropriate laboratory apparatus, laid-on electricity, gas and water. Sets of apparatus are provided in sufficient numbers to enable the whole class or group to do prescribed laboratory work at the same time.

School workshops are used for the practical study of production methods. Each class has its own section of the workshop, fitted out with a series of similar machine tools (turning lathes, for instance) so that each student has a place. Besides the basic equipment, the necessary minor tools and appliances are also provided. In the section there are also communal workplaces with grinding machines, gauging blocks, a few special lathes, etc.

In each such section there is a place for the master-craftsman, fitted out with the same tools, equipment, etc., as the students' own workplaces. At the master's place there is also a desk and a black-board; a locker for drawings, school and reference books and visual teaching appliances; a stand for posters, graphs and tabulations; shelves for reserve tools and measuring apparatus for use by the whole group; and a glass-fronted case for model work, typical spoilt work and other objects which can be used for demonstration to the class. The master's workplace is so disposed that he can see all the students and watch what they do. In the same way the students can see and hear all that the master says or shows them from his place.

At the school workshop there is usually also a technical office which gives information on all questions of practical training. Apart from the engineers and technicians on the staff, students in the higher classes sometimes work in this office. There are also a technical inspection service, a tool-room, a store-room for materials and finished products, a repair service, etc.

Outdoor spaces are also reserved for initial instruction in the use of machines (pit electric locomotives, tractors, etc.) in cases where it is difficult to arrange appropriate instruction in the early stages under production conditions.

These outdoor spaces and the school workshops at the manpower reserve schools and colleges are equipped with a great deal of apparatus of various kinds. For instance, they have 48,000 metal-cutting machine tools, hundreds of thousands of vices, 4,300 woodworking machine tools, 2,250 tractors, 7,800 combines, etc.

The students also form training sections in undertakings, which they run alone without any help, except, of course from the engineers or technicians and their assistants. There are many such sections in mines and some in open-hearth furnaces, for instance.

Sometimes part of the training is done in factory laboratories (testing materials, technical analysis) or in the materials or products store. Instruction is always supplemented by work under actual production conditions.

On concluding their theoretical and practical instruction all the students take final graduating examinations. The examining board includes representatives of the college (or school), of the assisting undertaking, and of the trade unions. The board tests the student's knowledge both of the theory of his subject and of the order, effect and control (with suitable apparatus) of technological processes. Apart from this the students have to do, under production conditions, a test job of a specified complexity. After passing the final examination the student enters an occupation at the appropriate level of skill. There is a job in his trade for every trainee.

Students at Soviet training institutions also receive all-round education. General education is included alongside technical instruction and provision is also made for extra-curricular work and participation in students' societies.

During regular classroom studies the teachers and instructors introduce their pupils to various aspects of material and spiritual culture, and attempt to instil in them high moral principles and a scientific approach to life. The young workers learn to put into practice these precepts and principles, and to work conscientiously and responsibly. Decisive factors in this process of training are the combination of theoretical study and practical training, and participation in productive work and in the building of a new society.

Labour in the Soviet Union is not a means of achieving material results; it

also contributes to an orderly and rational advance to socialism. As he helps to produce material wealth for the good of society as a whole, so the young worker develops a responsible attitude towards labour and public property. Correctly organised technical training is of great importance in producing in young workers a strong will, initiative, decision, perseverance, optimism and love of life.

Socialist competition has a large place in the activity of the man-power reserve schools and colleges. The competitive effort to exceed output targets by mastering new techniques and advanced working methods, to produce complex products of outstanding quality, to economise materials and electric power, to improve the material equipment and amenities of the school and its grounds—all this develops in the young student a spirit of mutual aid and collective effort in work and study, a sense of duty, a tendency not to be content with his achievement or to be beaten by difficulties.

All-round education, however, is not a matter for the classroom alone; students also have a host of extra-curricular activities the aim of which may be to improve their technical, occupational, social or political education, to promote the development of various tastes and talents, to enhance individual activity and initiative, or simply to provide cultural recreation.

Hundreds of thousands belong to the study groups which deal with subjects on the curriculum and related matters, and in which they can broaden their technical horizon and acquire habits of rationalisation and invention. Experienced leaders help them to make working models of complex machines, to construct devices for greater productivity, to modernise the machine tools and to prepare visual appliances for classrooms and laboratories.

Local exhibitions of the students' creative technical work are held every year. There is also a permanent "all-Union" exhibition of this work, which has had very great success and is visited by a great many workers from the Soviet Union and from abroad. At the international level, students' work has been shown in Poland, Rumania, Hungary and Czechoslovakia, as well as at the Brussels World Exhibition, where it caused great interest and made an excellent impression. Of the prizes awarded at Brussels in the field of vocational education 16 went to work by students at the manpower reserve schools and colleges of the Soviet Union, which included such unique exhibits as a working model of a "self-propelled excavator" made by the students at the Sverdlovsk Industrial College No. 1 (first Grand prix) and many others.

Lectures on political and scientific subjects, groups for the study of history and folk-lore, literary evenings and students' conferences—all these form part of the life of vocational training institutions.

These activities cover a wide range of scientific and technical knowledge, familiarise students with the best examples of classical tastes and cultural habits. About 18 million books are available in the libraries of the manpower schools and colleges and wide use is made of them.

The manpower reserve system has 46 special buildings for amateur cultural and artistic activity, over 1,300 clubs rooms, 900 wind orchestras and 1,000 orchestras of popular instruments. All this helps to stimulate amateur artistic activities, in which hundreds of thousands of students take part.

Important contributory elements in general education are the physical development of the young and the steps constantly taken to ensure that each new

generation grows up healthy and happy. Students of the manpower reserve schools and colleges get their physical exercise in a variety of ways including daily physical training arrangements (morning exercises and breaks for physical training during practical work), games or amusements between or after classes and excursions. There are also physical education classes as part of the curriculum, organised group gymnastics and sports.

The amateur sports club called "Manpower Reserve" is well known throughout the Soviet Union: it has done a great deal to encourage students to take part in physical culture and sports. Regular athletic competitions (summer and winter sports) are held at individual schools and also at the district and national levels. Students from the manpower reserve institutions regularly take part—and win leading places—in Union and international competitions. They have set up a good number of Soviet and world records.

A distinctive characteristic of socialist education is its community approach to education. A solid, well-organised student body can be a powerful force for education and discipline in any school or college. The formation of such a community, and success in its work, can be achieved only with the active participation of all masters, teachers, instructors and administrative personnel.

The vocational and technical training of workers is not confined to schools and institutions. Training, and especially further training designed to raise the workers' skill, is carried out on a large scale in the undertakings themselves.

Undertakings train their own semi-skilled workers. A combination of individual and team instruction is used for this purpose, the duration of courses not exceeding six months. The individual instruction is mainly practical and is given directly at the workplace during performance of the factory's output programme. The learner is attached to an instructor appointed for this type of training — usually himself a skilled craftsman for whom this is an activity concurrent with his main job. Practical instruction consists in demonstration by the instructor of the work process to be learned and an explanation of the rules to be followed in doing it; the learner then does the work himself under the instructor's supervision. Theoretical instruction is given by the same craftsman or—if several learners in the same or allied jobs can be brought together—by an engineer or technician. Team training plays a minor part in the training of semi-skilled workers. Usually the learners are placed in the existing teams of production workers; occasionally they are formed into "trainee teams" of their own.

In a number of industries new entrants are trained in special introductory courses, usually reserved for the more complex trades in which it is particularly important to provide systematic theoretical instruction, and for those in which it is difficult to give practical training at the workplace.

So-called "schools of advanced experience" are widely used to improve the skills of workers already in employment. These schools apply a basic principle of socialist emulation: in them the best workers provide comradely assistance to those who are less experienced with a view to improving group output.

At first these "schools" worked as follows: each school leader (chosen for his outstanding production record) imparted his personal fund of experience to a small group of workers in the same trade; directly from his workplace, the leader demonstrated the methods he used to obtain a high output, improve its quality, economise raw materials,

maintain his equipment in the best possible condition, etc. A consultant (from the engineering and technical grades) was attached to the school leader and had talks with the trainees, explaining and justifying to them the methods of work that they had learned. Instruction also included exercises at the learners' workplaces designed to give them practice in improved methods.

Subsequently, "schools of mutual instruction" and "schools of collective advanced experience" were started, in which the best working methods employed by a group of highly efficient workers are studied. Often it becomes necessary to help workers to master new equipment, to apply more or less fundamental changes in a technical process, to learn to make new kinds of products. Special courses are then arranged; as this provides a flexible method of giving instruction on new questions which face a whole group of workers. These courses consist of short spells of training, mainly of a theoretical character.

Technical progress leads to more complex operations, and the progressive mechanisation and automation of groups of processes make increasing demands on the workers' skills. Hence the present need for a special kind of technical instruction, aimed at raising the skill and wage-grading of the workers. This kind of instruction is given in courses in "production technique", as they are called in the Soviet Union. The training consists of practice on the job and theoretical instruction outside working hours.

New techniques, as well as advanced methods of scientific management, require a considerable widening of the workers' occupational qualifications—indeed, they may have to learn a second or even a third trade. Experience shows that combination of trades secures an economy in manpower, increases the productivity of labour and avoids breaks in production. Instruction for this purpose is provided, as a rule, by individual "attachment": a worker teaches his own skills to another coming from a different trade, and sometimes the instruction is mutual.

Training of production workers is not confined to industry. In agriculture, too, courses in farming and stock-raising techniques are widely used to spread scientific knowledge and advanced experience in collective and state farms. These courses are held in the winter (when little work can be done in the fields), so that great numbers of workers are able to attend them without leaving their jobs. They are spread over two years, and graduates receive the title of "agricultural technician, first (or second) class". Apart from these courses in farming and stock-raising techniques, there are various kinds of short courses at which agricultural workers improve their skills and obtain experience in trades allied to their own.

In December 1958 the Supreme Soviet adopted an "Act for the purpose of *linking the schools more closely to life and of further developing education among the people*". Apart from progress in general education at the secondary and higher levels, this measure prescribes a number of important steps for the further extension and improvement of the vocational training of the young. All institutions, of the various existing types, for the training of manual workers are to be transformed within the next seven years into a comprehensive system of vocational and technical colleges, which are classified as urban (courses lasting one to three years) and agricultural (one to two years). The network of these colleges will be gradually expanded.

The vocational and technical colleges will specialise in particular branches of the economy and prepare skilled workers for specific trades and occupations

in manufacturing industry, construction, communications, public utilities, agricultural mechanics, rural electrification, commerce, and cultural and social activities.

Measures are to be taken to improve the staffing of all vocational and technical colleges, and supply them with the appropriate training workshops and laboratories. Moreover, to ensure that the necessary practical instruction and training will be given, the colleges are to be closely linked with progressive undertakings that have new equipment and apply the most advanced techniques and methods of organisation. Arrangements will be made for the use of the best methods of instruction, the systematic co-ordination of theory and practice, and the judicious combination of practical instruction in school workshops and in undertakings.

Besides all this, some young persons will be trained for simple semi-skilled jobs either by study at the general secondary schools with practical industrial instruction or by means of individual and group instruction on the job.

The vocational and technical colleges will take young persons who have completed the eight-year general school course (which is being introduced instead of the existing seven-year course). As the reform of the general secondary schools envisaged by the Supreme Soviet will take three to five years, during this period some of the present technical colleges will be retained so that there will be accommodation for all those wishing to enter them on completion of the ten-year general school (full secondary education). Some of the other existing vocational training institutions will also be retained (industrial, construction and other colleges of the same type) for juveniles who, for some reason, have not finished their secondary education.

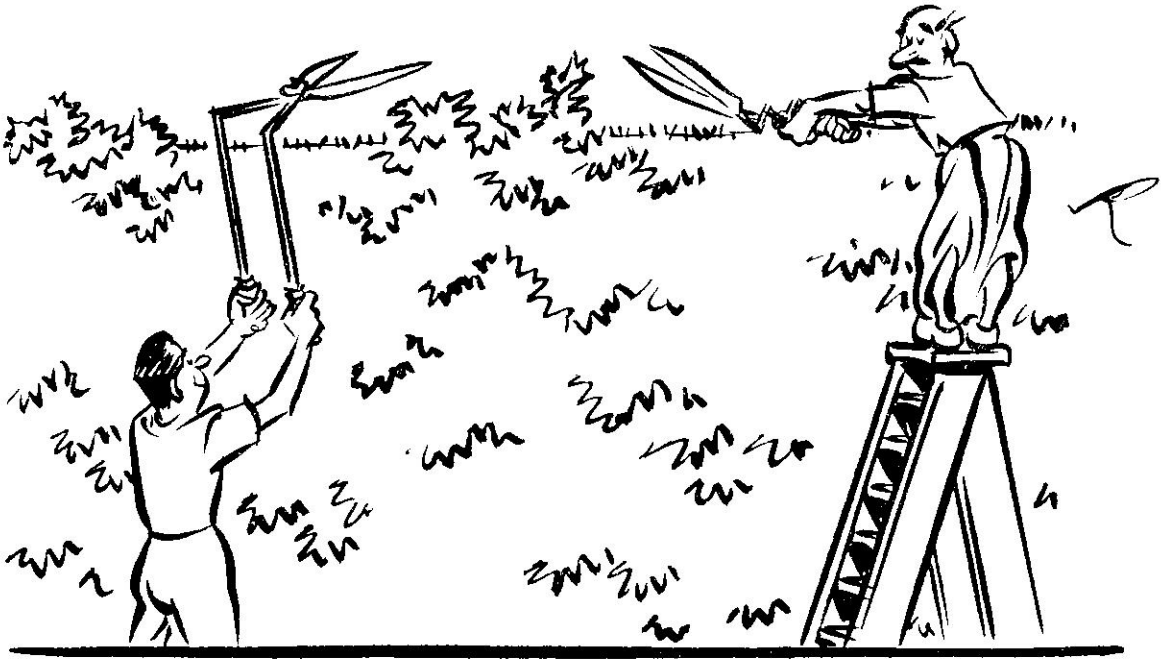
Substantial changes are being made in the curricula of vocational and technical colleges to take account of the new conditions under which they are to operate. More attention will be paid to training under production conditions and to learning new techniques. The students will be familiarised with typical operations in several cognate or related trades. In order to turn out young workers who are fully prepared for self-reliant, highly productive work, the length of the period of practice in undertakings is being considerably increased.

A number of changes are being made in theoretical instruction too. A new course entitled "Automation and Mechanisation of Production" is being introduced, so that students will be able to learn of the achievements and prospects in industrial technology and the development of new techniques; they will study methods and means of mechanisation and automation of groups of production processes; and they will acquire the minimum of additional knowledge they will need if they are to take an active part in improving industrial performance.

For the same reasons a separate course is to be given on the *organisation and economics of production*. The course in electrical engineering will be expanded to cover the *elements of radio-electronics, for without some knowledge of these subjects a worker is lost in a modern automated undertaking.*

Each person who takes the full course at a vocational and technical college will be given every opportunity of completing his general secondary education and obtaining further specialised education in the trade which interests him—all without leaving his job.

This reform of vocational and technical education, together with the improvement in general and higher education, will lead to further progress in the cultural and technical levels of all workers in the Soviet Union and will hasten the execution of the new plans for development.



Productivity Movement in Japan*

Japan is generally regarded, particularly in the countries of Asia, as a model of productivity. Probably, few communities are as cost-conscious as the Japanese. Productivity is, as it were, written in the Japanese character, not only in their goods but also in their books, paintings, railways, their small home gardens which by some productivity technique are made to look very much bigger than they are. With all that there is a certain element of humility which is, as it were, a part of their productive organisation. The Japanese were able to accomplish an industrial revolution, without regimentation, without seriously upsetting their social order, in a period of time that is historically unique both in quality as well as in duration. Japanese goods were able to compete with the goods of very advanced countries which started long back in the game. Not all the theories of sweated labour and the employment of a multiplicity of economic tricks, such as, multiple exchange rates etc. explain the very large margin by which Japanese goods outpriced those of western countries in the pre-war period. The real explanation lies in the productivity of the Japanese system.

Japan has been able to accomplish a second industrial revolution in the post-war period with record levels in steel (for which she has to import iron ore from India) and electric power. Despite a rocketing inflation, she has been able to build up a growing foreign market. She has adopted productivity techniques from the United States and made them her own. With all that, the Japanese acknowledge with fulsome praise their debt to modern techniques in management, operations research, work study and the like, of which recent Japanese literature is only too full. The facts given below about the Japanese Productivity Movement are insufficient to give a complete idea of what it is really like. Japan is becoming a radiating centre for the productivity movement in Asia.

THE Japanese attitude to the productivity movement is characteristic: They regard it as "an Olympic game" but in their own opinion, "we...could hardly be considered qualified to join this Olympic game"! The real fact is that Japan has been paying serious attention to the development of a productivity movement from the early post war period. The Ministry of International Trade and Industry and the Ministry of Labour made a study of the productivity movement abroad and generally emphasised the necessity of starting such a movement in Japan. In fact, the Government appealed not only to the material instincts of the Japanese but also to their patriotism, underlining the productivity movement as "the last trump for the independence of Japan's economy".

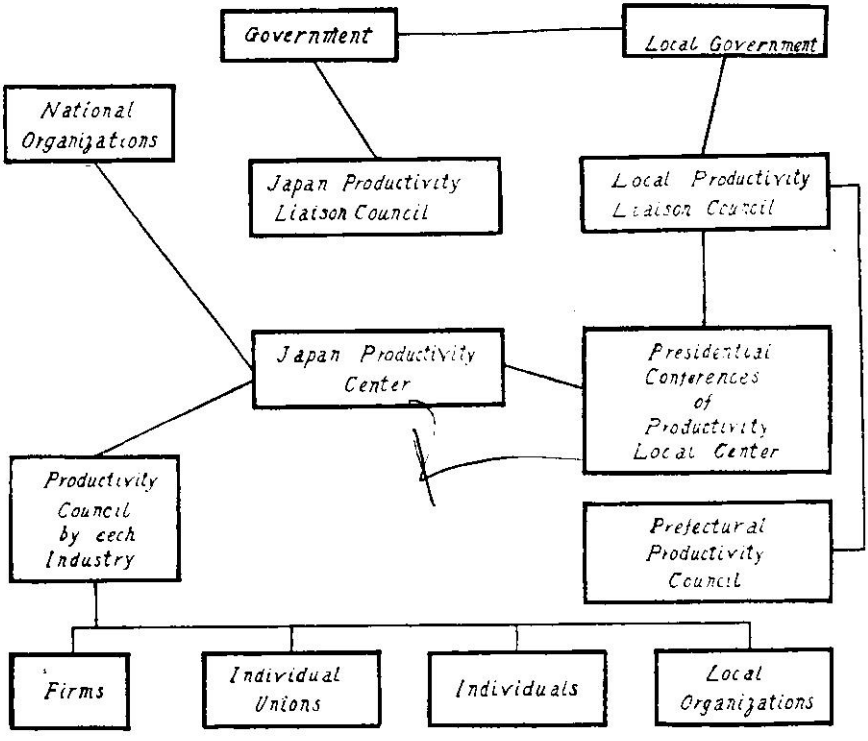
Towards the end of 1953, important and influential private business organisations began to take a serious and systematic interest in the productivity movement. The Japan Management Association, acting as the Centre of the Movement, got the collaboration of the Federation of Economic Organisations, the Japan Federation of Employers Associations and the Japan Chamber of Commerce. In March 1954, the US-Japan Productivity Increasing Commission was founded as a non-governmental organisation, followed by its replacement by the Japan Productivity Council in June 1954. With its establishment,

* Prepared by the Editor of Publications, NPC

two questions had to be settled: (a) how best to utilise the technical knowledge so generously offered by the USA and to incorporate the highly productive techniques of its economy into the industrial structure of Japan. (b) The relationship between a non-governmental productivity organisation and the Government, since the productivity movement would in any case be concerned with the basic national economic policy, in relation to industrial structure, employment etc.

As a result, the productivity movement, first started as a non-governmental concern, was adopted by Government as one of its basic foreign and domestic national policies. On 24 September 1954, the Japanese Cabinet took its decision on measures for increasing productivity. The Japan Productivity Council was dissolved and in its place was created the more powerful, permanent Japan Productivity Centre (JPC) whose activities were to be encouraged by Government through a specially constituted Japan Productivity *Liaison* Council (Seisansei Renraku Kaigi)—a deliberative, policy-making organisation. This Council is composed of 12 Vice-Ministers of the Japanese Government and 12 directors of JPC. Parliament of Japan (the Diet) is itself connected with the productivity movement through its sub-committee on the Promotion of Science and Technology. This committee, in fact, takes up important problems as they arise in the conduct of the productivity movement and exerts influence on the formation of government policies in the field of productivity administration. Then there is a special committee consisting of a group

Organization of Productivity Movement in Japan



of parliament (the Diet) members, forming the Productivity Council (Seisansei Kondankai) which discusses productivity problems with the JPC.

After basic policies have been established, concrete plans to execute them are formulated by the Board of Directors of the JPC, composed of a total of 35 members, representing labour, management and the general public (including academic interests). The diagram printed on page 207 gives a broad idea of the structure of productivity organisation in Japan. It shows that the productivity movement in Japan is well-grounded, both politically and economically. At the functional level, JPC has various *liaison* organs with management, labour and professional bodies. Like the British Productivity Council, it is also concerned with increase in the productivity of agriculture. In fact, as early as 1956, the JPC set up an Agricultural-Forestry Productivity Conference. Apart from this, in its own primary industrial field, the JPC set up regional organisations to serve as local headquarters for the productivity movement in Tohoku, Chubu, Kansai, Chugoku, Shikoku, Kyushu and Hokkaido. These regional headquarters are now branching out on prefectural and municipal levels. A prefectural Productivity Council was formed in Kanagawa Prefecture in 1957, in Nigata and Toyama Prefectures in 1958 and Gifu Prefecture in 1959. Municipal Productivity Councils have been set up in Shimizu and Kawaguchi. The Regional Productivity Headquarters are sponsoring various classes on raising productivity, exchanging inspection teams among themselves, helping in the modernisation of the management of small business, general improvement of labour relations etc. Last but not the least, industries have developed their own Productivity Councils, of course, with the assistance of JPC. Major industries, such as coal, metals, chemicals and electric power have their own Productivity Councils with membership, both of management and labour.

It is, however, not the organisation as such but the principles underlying the organisation and the effectiveness with which these principles are carried into practice, that is of material importance. Shortly after the establishment of JPC in March 1955, a Productivity *Liaison* Conference was held, which enunciated the three principles on which the productivity movement was to be based: "...the productivity movement should be developed as a *national movement with deep understanding and support of the people.*" The Conference stated the basic philosophy of the movement as follows: "1. Increased productivity ultimately increases employment, but as to the transitional surplus employment, pertinent measures should be taken to prevent possible subsequent unemployment as much as possible by the joint efforts of the government and people standing on the viewpoint of the national economy, by means of transposition etc. 2. The actual system for the increase of productivity based on each industry should be studied and consulted, by the joint efforts of management and labour. 3. The results of productivity increase should be fairly distributed, according to the actual conditions of the national economy, among capital, labour and consumers."

Apart from this statement of economic philosophy it was made clear that the productivity movement launched with the establishment of the JPC was quite different from the pre-war rationalisation movement. It was "not a management-implemented programme of an individual enterprise from its own standpoint..."

Every attempt was made to secure the cooperation of Labour, which was considered vital. Matters were taken to the stage where the Japan Federation

of Labour Unions itself adopted the following eight principles at a meeting held in June-July 1955. They are: 1. The productivity drive is different from the individual rationalisation movement and efficiency progress movement. It is a movement which is founded on an integrated policy aiming at independence of the Japanese economy and improvement of the nation's standard of living. 2. The productivity movement is not such as to aim at increasing profit of industry by intensification of labour's burden, but on the contrary, bringing about the improvement of labour conditions and real wages. 3. The productivity drive should realize the increase of employment through expansion and development of the economy. Therefore the employers and the government should devise effective measures to avoid the danger of unemployment and to provide security of employment. 4. The productivity drive is not such as to bring about the accumulation of capital, but aims at the stabilization of small and medium industry and the improvement of the life of labourers. 5. All the results achieved through the productivity drive should be properly used for the reduction of prices, the improvement of labour conditions and the renewal of equipment. It is indispensable for succeeding in the productivity drive that industrial democracy and rational labour relations should be established. 7. As to actual activities for the increase of productivity, labour agreements are to be concluded between labour and management for smooth progress of the movement. 8. The JPC, considering particular situations in Japan, should promote the productivity movement with a sincere attitude, fully adopting the opinions of labour unions interested."

The JPC accepted these eight principles and the Japan Federation of Labour Unions joined the Centre on 16 September 1955. Subsequently, All Japan Seamen's Union and All Japan Labour Union Conference also became members of the JPC. Internationally, the ICFTU has decided on a policy of cooperation with the JPC, as long as the rights and benefits of labour are guaranteed. It is now claimed that *labour relations in Japan revolve to a great extent around productivity.*

It was claimed by the JPC representative at the First Asian Productivity Conference that it had been "instrumental in the voluntary establishment of sound and democratic relationship between these two parties"—management and labour. Special emphasis has been placed by JPC on labour-management relations since the very beginning of its operations because the true merit of the productivity movement faces a crucial test in this area. JPC has a permanent management-labour consultative committee designed to provide a common ground for the representatives of both management and labour to discuss and consult with each other over problems encountered in the productivity movement. JPC also holds special meetings on productivity for labour unions, on both the national and regional levels. These meetings are designed as a medium to find out the needs of workers rather than to educate them. An important event in JPC productivity movement was the holding of a national conference by organised workers on productivity movement. The debate started in each local district and ended with a final meeting in Tokyo in 1958. A total of 2.5 million members of labour unions in all parts of the country participated in the debate. Japanese Labour Unions again met in October-November 1959 in different parts of the country to hold discussions on productivity. The subjects for discussion were (a) the ways and means to cope with the current technical revolution, (b) secure steady employment, (c) establish modern labour-management relations and (d) achieve productivity in medium and small sized industries. A total of 3.5 million labour

representatives, or 1 million more than in the first productivity discussions held in 1958, participated in the conference.

For an outside observer it would, of course, be a little difficult to comment on internal organisation but it is clear that the JPC has settled down to its task in an extremely businesslike manner dealing, for example, with handling problems according to each type of industry or enterprise and solving each problem as a matter of business management. In technical inter-change with foreign countries, to which detailed reference is made later, the JPC has operated on a scale that is really remarkable. Overseas study teams have been sent out, foreign experts invited and the basic rational methods of high productivity countries have been studied in intimate detail. The Japanese have "learnt open-heartedly in what point our economy and industry are backward and what are the good points in America and the European countries, which can be adopted in Japan."

While the Japanese have done everything to benefit by the rather unusual opportunities they have had for the absorption of foreign techniques in their economy, the productivity movement in Japan is really and basically "a domestic movement..." In fact, even the foreign programmes are thoroughly organised with a view to see that Japanese industry benefits in all possible ways from foreign contacts. Groups have been formed under the initiative of foreign productivity teams to study actual utilization of productivity techniques in iron and steel, electric machinery, electric engineering, casting, shoe making etc. There are specialised committees in charge of the planning, operation and review of achievements in the field of productivity. These committees are composed of experts in specialised fields and plan JPC activities from the standpoint of the national economy.

Special emphasis has been laid on research in the functioning of the JPC. There is a special Productivity Research Centre and a number of committees dealing with productivity research, whose function is "to grasp broad problems in terms of productivity, and to make thorough research of them." JPC Research Committees are conducting studies on a wide range of productivity problems, both theoretical and applied, including measurement of productivity, distribution, employment, market analysis, the precision of machine tools etc. Studies have also been made of various productivity problems by universities and research institutes at the request of JPC. Among the current research subjects, the major ones are: a. technological innovation and its impact; b. employment problems arising from increased productivity; c. equitable distribution of the fruits of increased productivity and d. management-labour relations. The JPC proposes to establish shortly a society to conduct research on the latest trends in business management in collaboration with the National Industries Conference Board (NICB) of the USA. An outstanding feature of the role of the new society will be research on how the advanced techniques and knowledge of business management in foreign countries could be applied to the management of Japanese enterprises, through a coordinated study of materials collected through NICB, AMA and RKW (German Productivity Centre).

Another point which is worthwhile mentioning is that of experimental factories, selected in order to promote productivity in certain lines. These experimental factories are to serve as a sort of reference for solution of problems within the industry. JPC has also taken upon itself "to carry out *industrial education for every position from management to apprentice.*" The Productivity Education and Plan Committee organises training programmes in productivity for both managers and workers. The committee also sponsors conferences of

experts on the method of Productivity Education. It meets an increasing demand for data on productivity training from business firms, plants, unions and universities. JPC itself conducts training courses and lectures in major Japanese cities in order to foster a healthy trade union movement and to instil the spirit of modern management into Japanese concerns. The emphasis of the training courses is on case-studies. Recently a Case Study Group was organised in which Japanese University Professors participated in preparing case histories of Japanese business firms in cooperation with American case writers invited by JPC.

An important aspect of the organisation of the productivity movement in Japan is the JPC focussing its attention on small sized businesses. "For small scale industries we have developed many specialist projects such as training of management consultants, establishment of standard cost accounting systems, mobile technical consultation for small firms and plants, analysis of managerial and production problems in demonstration plants and technical enquiry service..." The peculiar structure of the Japanese economy made up of a few big businesses and a predominant number of small business units has emerged as the major obstacle to the productivity movement. The JPC therefore spends about a third of its budget on small business projects. As a first step, JPC embarked on a series of assistance measures for smaller businesses such as the opening of common-use laboratories, technical counselling and so forth. In this field, JPC has largely followed the pattern of European countries. In 1958, JPC introduced unified cost accounting systems in various industries in an effort to facilitate the adoption of scientific management methods in small and medium-sized enterprises. As another basic measure to help raise the efficiency at the small business level, the Centre opened in 1958 courses to train management consultants specializing in the problems of small and medium-sized enterprises. Fifty-four small business consultants, the first graduating class of the one-year course, were sent out early in 1959 to cultivate an entirely new professional field. The training of the second class of future consultants for small and medium-sized enterprises has already got under way. Ten of the first graduating class are attached to the Tokyo headquarters. They provide advice to smaller businesses in the Tokyo area. The counselling and guidance by these experts are conducted both on regional and industrial basis.

The casting industry in Nigata Prefecture was selected as the model case for the JPC's assistance programme for small and medium-sized enterprises. The counselling and guidance work in the area by JPC experts started early in June 1959. JPC also plans to introduce unified accounting systems into some 40 specialized industrial fields, including farm equipment, auto-parts, tableware, communication equipment and glass.

Apart from specialist activities, the general public in Japan has also received considerable attention from the JPC, the general public in the context including groups and individuals with intimate interest in industrial problems. In Japan such groups form an important part of the general public opinion. For them, the JPC organises seminars on general and technical problems, training courses, lecture meetings, voluntary study groups and study teams (of about 10 members) that tour domestic industries. As a domestic project, the JPC has conducted representative meetings by members of the productivity study teams sent abroad. Such meetings have been held across the country for more than 300 times with the attendance of about 150,000 but even this large figure is not uptodate. What is probably worth noting is the popularity of the purely

domestic programmes of the JPC. To give just one illustration, a top management seminar attracted a larger number of persons than could be accommodated and a demand arose for a second holding of the seminar. The press went to the extent of calling it *a seminar boom.*

The JPC has been holding international seminars on industrial engineering and other subjects, in cooperation with the ICA. The first seminar was held in 1958 and the second in August 1959 at Tokyo and Osaka. A characteristic of these seminars is the emphasis placed on practical problems confronting management in the application of industrial engineering methods. The participants probed the functions of industrial engineering by case method and group discussion.

The JPC has its publications, with a rather extraordinary circulation. Its weekly paper called the Japan Productivity News had, a year ago, a circulation of over 50,000. This paper discusses practical problems and their possible solutions, suggestions for the modernisation of management, and subjects pertaining to small business and organised labour. From 1 May 1959, JPC has been publishing a monthly newspaper, Productivity, which has a world-wide circulation. As for books and periodicals, the JPC has published 120,000 copies of 47 reports of productivity study teams for the benefit of Japanese industry; and this figure is not uptodate. The JPC publishes every month a Technical Digest, and the Productivity Series, three times a month. JPC has also published literature on the Theory and Practice of Productivity etc. It has contracts with four radio systems for broadcast of commentaries on productivity. It has built up a respectable film library: "We believe that our auto-slides and publicity films are drawing the attention of public to the advantage of our movement."

It is difficult to give an uptodate account of the working of the productivity movement in Japan, for there is evidence to show that it is almost daily growing. A number of teams leave Japan, every month, for learning foreign techniques. 13 Teams left for the USA in January 1960. The Foreign Programme has been growing from year to year: 15 Teams in 1955, 27 in 1956, 43 in 1957, 62 in 1958; and now it is becoming a little difficult to count, with some Teams arriving and others going. It is estimated that JPC has by now sponsored more than 200 Teams for study of foreign techniques. By the time, the First Asian Productvity Council met in Tokyo in March 1959, more than 2,000 observers had been sent abroad in the technical inter-change programme: 1300 from mining and manufacturing industries, 170 from among trade union leaders, 280 from agricultural organisations and 260 from the universities and government offices. Besides, 150 professors and others travelled on exchange arrangements with the USA. Long term trainees have been sent abroad to study nuclear science, aviation and other subjects. Specialists have been invited from overseas to conduct seminars, field guidance projects and public lectures on subjects of productivity. Though this work is also on a big scale, it is the Teams going out, which constitute the bulk of JPC's Foreign Programme.

Japan sent its first iron and steel industry team to the US in May 1955. Then a number of teams followed, dealing with a wide variety of subjects : collective bargaining, heavy construction, advanced management, business cost accounting, urban transportation, economic analysis, Hokkaido development, electric machinery and equipment, atomic nuclear safeguards, small business retail distribution: these are only a few of the teams that have gone abroad. These inspection teams came from widely diversified fields including industry, labour unions and agriculture. Experience and first hand knowledge gained by Japanese businessmen have

given them a clear idea of the goals they should attain in running their business.

The US tour programme, in its first phase, placed emphasis on giving Japanese industrial leaders opportunities to familiarise themselves with general problems encountered in raising productivity in various industrial fields. Emphasis later shifted to specialised technical studies, as Japanese businessmen came to know more about the industrial set up in the USA. JPC has, therefore, sent more specialised teams in recent years. This switch to specialised studies and inspection is more fully explained by the fact that Japanese enterprises have now recovered and modernised their management and production to such an extent that they can profitably take in advanced specialised techniques and know-how from American industries. It has been reported that the recent study tours by specialised teams had immediate and conspicuous effect on productive efficiency in Japanese enterprises. In recent years, JPC overseas tour programmes have included labour union leaders and representatives of small and medium sized businesses. In 1957, JPC also started sending inspection teams to European countries. Besides, many experts in specialised fields have been invited to help Japanese businessmen in the application of advanced foreign techniques at their plants and offices.

This technical exchange programme has produced many desirable by-products in addition to their primary achievements. Such, for example, are the contacts and relations formed between Japanese business leaders and the American Management Association (AMA) which have later developed into a private exchange programme between them. The contacts, made by JPC staff during their United States tours, with such organisations as the American Materials Handling Society, American Marketing Association and American Institute of Industrial Engineering have led to the creation of counterparts in Japan.

The labour teams have had contacts with the American Federation of Labour and the Congress of Industrial Organisations (AFL—CIO). Japanese Unions have also been given opportunities to get acquainted with labour leaders from the USA and West Germany, visiting Japan under the ICA Exchange Programme. Increasing understanding by Japanese labour, of union activities in foreign countries is believed to have helped greatly in modernising labour practices as well as improving management labour relations in Japan.

Case Studies have been made of how far industries have benefited from the experience of the study teams sent abroad. In respect of Japan's steel industry, these case studies reveal substantial results. The rapid progress recently noted in Japan's automobile industry owes a great deal to the knowledge of administration and technical innovations, acquired by inspection missions sent by the JPC to advanced countries in America and Europe. Japanese inspection teams have learnt a great deal from such first-rate car manufacturers as the Ford, Christler and General Motors and from such outstanding electric equipment manufacturers, as General Electric and Westing House. The result has been that Japan is now exporting its products to the American market and other parts of the world. Major automobile companies in Japan such as Missan Motors and Isuzu have signed contracts for technical tie-ups with foreign car manufacturers. Case Studies such as that of the Toyota Motors Company show that modern American management techniques have been fully introduced in the various aspects of the company's management ranging from production to office management and cost control. Mitsubishi Nippon Heavy

industries report improvement in production control, plant layout and transportation. The entire forging industry has gained considerably as a result of a team sent to the United States in January 1959. This is also proved by case studies covering the Tokyo Forging Company, Japan Forging Company, Daiichi Forging Company and Hokuriku Forging Plant. The metal pattern industry has set up an export firm, specially for the purpose of introducing Japanese products to the United States market. The oil pressure machine industry has been offered a technical tie-up by an American manufacturer.

It is obvious that the whole foreign programme of JPC has been rightly and wisely designed so as to help Japanese manufacturers raise their productivity in the utmost furtherance of the basic interests of the Japanese economy. JPC has a project of inviting American industrial engineers, including Russel Wright, to promote Japan's handicraft exports to the USA. Apart from this, Japan's Asia programme, to which a reference is made a little later, is equally substantial.

JPC actively promotes technical exchange among different industries as well as individual firms in order to raise the productivity of industry as a whole. New techniques, major innovations and processes and improved management of labour relations achieved by a new company are shared with other enterprises through the organisation of JPC. Even during the early years of its working JPC set up as many as 20 teams specialising in industrial engineering, transportation control, small and medium sized business management to promote inter-firm technical exchange.

The Japan Productivity Centre has many other activities, such as for example, the rehabilitation of flooded areas. In October 1959, it set up a Chukyo District Productivity Emergency-Counter-Measures Committee to aid the industries in Central Japan, ravaged by the typhoon. This committee supported the rehabilitation work of the Central Japan Productivity Centre by mobilising its branches throughout Japan, sending inspection groups to these areas to collect data for its future relief operations. The committee carried out restoration work in the typhoon-stricken area, placing particular emphasis on smaller enterprises. The committee has also issued guide books for repairing various machine motors in order to help people perform temporary repairs of machines. Though it looks small, this is a vey extraordinary development.

The above account shows that the JPC has done extremely well in regard to the productivity movement in Japan. It has now moved further. The JPC has created an atmosphere in which there is a "keen desire to achieve still higher productivity in collaboration with fellow Asian nations." In fact, an important line of JPC's international operations is the extension of technical cooperation to Asian countries. By the time this Journal is published, Japan would have played host to a number of productivity delegations from various Asian nations. In addition to the Asian Teams visiting Japan, the JPC is also organising exchange of technical trainees. During the current year, Japan will receive 820 technical trainees from south-east Asia and send out 132 Japanese experts to south-east and west Asia. In fact, there is a special semi-government agency, the Asia-Kyokai, handling technical exchange operations with south-east Asia on behalf of the foreign office. Asia-Kyokai has arranged training courses and facilities for a total of 1587 trainees and researchers, mostly from south-east Asian countries. From April 1960, the Ministry of International Trade and Industry will receive overseas engineers for training in heavy industrial techniques under a new programme called the "Tokyo Plan". During the fiscal year 1960, 90 foreign en-

gineers will be invited to study in Japan for an average of 6 months each, with half or 75% of the air transportation cost, living expenses and training fees to be borne by the Japanese Government. In the following fiscal year the number of the trainees is expected to be increased to 200.

Japan has been taking special interest in the establishment of an Asian Productivity Centre. In fact, a special high-powered team was scheduled to go round the world for the purpose, as this Journal goes to press. The following extracts from an article by Sri Khiro Nakayama, Vice-President of the Japanese Productivity Centre are significant: "...I hope the Japan Productivity Centre will do its utmost, making use of its five years of experience, to contribute to *this enterprise of the century* in a modest spirit of cooperation, keeping close contact with friendly countries of Asia...To achieve this purpose the JPC should push the exchange of technical information with other nations by sending its delegations to conferences and committees held in many parts of Asia. The function of 'Productivity' as an organ paper in Asia should also be strengthened and the bulletin must become a clearing house of Asia and the world...The JPC has been giving lectures for training small enterprise consultants for two years with remarkable success...Believing that the programme can be useful for all Asian nations, we are planning to invite trainees from other nations in Asia to these lecture meetings..." The Japanese Productivity Movement is becoming an Asian Productivity Movement.

* * *

PRODUCTIVITY IN EXCELSIS?

The research workers of the Kyoto University in Japan have succeeded in designing a machine which takes up the spoken sound vibrations, analyses them into vowels and consonents, correlates them with its memory section, transforms them into electric waves which operate an electrical typewriter and thereby print the speech into Roman letters. The machine at present is a very complicated one, using several hundred valves but its mass production is likely to revolutionise tele-communications, relieve typists and clerks from their drudgery and make them available for more useful and pleasanter work.

Productivity Is Everybody's Business

KENNETH S LEVICK*

Much of the discussion of productivity becomes highly specialized and complicated. This is unfortunate, for some of the most significant things about productivity are very direct and simple and can be made meaningful to the average person. Perhaps most fundamental is the direct relationship between productivity and living standards—a relationship which often does not seem to be generally realized.

This direct relationship does not apply necessarily to the individual. For a society as a whole, however, the connection is obvious. We cannot consume more than we produce. The people of a country have at their disposition, for investment or consumption, only what they have collectively created. Each person's production is exchanged directly or through a money medium for the products of other people. The average consumer can command goods and services only to the extent that others are willing or able to exchange them for what he has produced.

"PRODUCTIVITY" is used here in its basic sense as the ratio between input and output. It is perhaps unfortunate that we generally speak of productivity in terms of labour input. This focusses disproportionate attention upon the labour-saving aspect of productivity improvements and creates doubt and concern in the minds of workers. This over-emphasis upon productivity in terms of labour input ignores or neglects factors which are possibly of more importance for India at the present time, such as the productivity of capital equipment (intensity of machinery utilization) or the productivity of raw material (waste and scrap reduction). However, analysis of productivity in labour input terms is important because it indicates the average individual's contribution to production and thus emphasizes the relationship between productivity and living standards.

This relationship is perhaps most directly obvious in the case of the farmer. An Indian farmer who cultivates his own land knows just how much he and his family have produced in a year. That production, including the goods and services people will give him for the part of it he has available for exchange, obviously marks the limit of his consumption. Low productivity affects him in two ways. He himself has not produced very much. And the people with whom he must trade have been similarly unproductive. During the year they have not produced a great deal and they cannot give him very much in exchange for his product.

This is a very simplified economic analysis, largely ignoring capital and other inputs as well as scarcity factors. The over-simplification does not alter the basic validity of the approach, however.

This same relationship applies generally throughout the society. Note the apparent productivity in the activities you observe. Some individuals or trades, through a monopoly position of one type or another, may secure rewards greater than their contribution. In other cases the ability to command

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goods and services may seem to fall considerably below the apparent level of productivity. This is because it is the general level of productivity in a society which affects living standards, rather than the individual situation. Those involved in certain trades and functions may be as productive, because of an unusual availability of capital equipment, as the person performing a similar function in West Germany or the USA. Many industrial workers in India operating particular machines are processing nearly as many units in an hour or a day as their counterparts operating the same machine abroad. An Indian taxi driver may be responsible for as many passenger-miles per day as a driver in New York or London. Because the general level of productivity in the country is low, however, the more highly productive individuals are not able to enjoy the same standards of living as their counterparts abroad. In some cases, low levels of productivity may prevail elsewhere in the same organization so that the operator's share of the total product will not be as great as his personal productivity would seem to indicate. In other cases, such as that of the taxi driver, the general low level of productivity limits the effective demand and the ability of others to give him the same return for his services as would be the case in a generally more productive society. A doctor or dentist finds himself in the same position. An Indian dentist may fill as many teeth in a day as an American dentist, but the prevailing low level of productivity makes it impossible for his patients to pay as much for his services as dentists receive in highly industrialized countries.

These individual cases of the productivity of an individual or of a specific trade matching that in more highly developed countries are rare. The more typical situation is that of the Indian farmer, who produces but little more than he needs to feed himself, his family and his animals. The average productivity of industrial workers is only a fraction of that which prevails in the United States or Germany. This of course is not the personal fault of the Indian worker, just as no particular credit is due to the German or American worker for his greater productivity. Neither is it the fault of the Indian people as a whole. It is the result of a host of historical and other factors which have determined past levels of education, of invention and innovation, of capital investment, of managerial and technical development, as well as many other factors which affect production efficiency in a society. Thus each individual and each generation of a people have no responsibility for the overall level of productivity which they inherit from previous generations. We know by the experience of many countries, however, that great changes in the productive efficiency of a people can be accomplished in relatively short periods. We are responsible, therefore, for what we individually and collectively do with the production opportunities available to us in our own working careers and for the situation as we hand it over to our childern.

The reader may feel that this analysis confuses production and productivity and that the key importance of capital equipment is being ignored. The greatest differences between productivity levels of individuals or societies may be due to the availability of machinery. *In the short run*, however, the production capital available is fixed, and it is only the effiectiveness with which equipment is used that can significantly increase production and permit higher living standards. Production unrelated to productivity is meaningless for if resources of greater value than the product are consumed in production, the society's interest and the general living standard cannot be benefited. Perhaps more fundamental still, it is only the *effective* use of existing

capital which can produce a margin beyond consumption requirements for investment in the additional plant and machinery to permit a major future improvement in living standards.

Productivity in India is particularly low in distribution and retailing. Compare the volume of commodities handled per day by the typical Indian merchant or shop-keeper's assistant with that of the clerk in a London department store or in an American Supermarket. Consider an ox-cart driver, whose low productivity in ton-miles per day can be seen to be in rough proportion to the goods and services his income will command. His competitor in the transport industry, the truck driver, operates expensive capital equipment. Yet he also is significantly less productive than his foreign counterpart, because of the lesser capacity of his vehicle and the lower average speed he can maintain on the road. We can see here the impact of factors completely outside the influence of the individual. The truck driver's employer cannot get a permit for larger and more efficient tractor-trailer units. The road surface will not permit high speeds, slower types of vehicles continually impede his progress, and frequent stops must be made at octroi and check posts.

The comparison between the ox-cart driver and the truck driver again illustrates that the general level of productivity is more important in determining living standards than is the productivity of the individual. The differences between these two in remuneration and the ability to command goods and services is not as great as the difference between their productivity in ton-miles per day.

Thus we see that this is an area of human life and relationships where we have every reason to think socially and to be interested in the general improvement. For, again speaking generally, it is only the productive individual functioning in a productive society who is able to realize fully the benefits of his own productivity. In fact, the general level of production efficiency is so dominant that the relatively unproductive individual still benefits greatly in a productive society. This will be true even though he may not be producing any more than his counterpart in a less-developed country or in his own country many generations ago. For example, a barber, a restaurant waiter and a hotel doorman in New York may not provide their services to any more people in a day than their predecessors did a hundred years ago or than their counterparts do in New Delhi. Their trades simply have not participated in the general productivity advance. But they enjoy a higher standard of living than did their grand-fathers because they live in a more productive society which rewards them out of its abundance.

Thus we see that in the modern world, and in the mass sense, it is the general good which determines our own. A striking example of this mutual interdependence is the wealthy individual in a relatively unproductive society. He is not able to enjoy many of the advantages which are taken for granted by his counterparts in, let us say, France or Belgium, because of the general low level of productivity in the society in which he lives. Health and sanitary conditions may expose him to constant danger from which a person in a similar position in Western countries would be free. Services and facilities which his money would permit him to enjoy in a more productive society just do not exist, such as fast and convenient travel on a good highway or airline net work, adequate water and electricity supply, well-developed communication services or recreational facilities. Many commodities (luxury autos, photographic equipment, household appliances) are not manufactured in India because of the small domestic market and they cannot be imported because of foreign exchange stringencies. Perhaps the most

important of these satisfactions available to the wealthy only in the more highly productive countries is the enjoyment of their abundance in the comforting knowledge that even the least fortunate of their fellow-citizens are able to live in reasonable security and freedom from want. We must not ignore that wealth in some ways buy less in more productive societies, most notably in domestic service and hand-craftmanship. On balance, however, there can be little doubt that the generally low productivity of a surrounding society limits the living standards, broadly defined, of even the wealthy.

Thus, productivity is a problem and an opportunity for all. All in a society rise together as productivity improves. All will gain from a general increase in the efficiency of production of goods and services. Productivity is not a matter of interest and concern only to the specialists. Perhaps the most important aspect of a general productivity improvement effort, such as the National Productivity Council is undertaking, is the creation in the national consciousness and in the minds of all the people of a dissatisfaction with waste and inefficiency, of an interest in more productive operation, of an atmosphere generally conducive to continuous critical analysis, innovation, and improvement. An environment must be created which stimulates a constant effort to learn by previous experience and the example of superior practice by others, to permit more productive operation in one's own activities whatever they may be.

In truth, therefore, productivity is everybody's business.

Productivity!

Suggestions Schemes

A SUGGESTIONS scheme is a system whereby a firm's employees, particularly the lower grades, are encouraged to put forward ideas for improving production, equipment, materials handling, safety precautions and so forth. For suggestions of value, an award is paid and this is commonly calculated as a percentage of the estimated saving to the firm. The main purposes of a suggestions scheme are: a. to improve efficiency; b. to improve human relations; c. to give employees the opportunity of using their latent brainpower. To run a suggestions scheme entails a great deal of continuous work. If well-run, it can be rewarding, both for management and employees.

In any mass-producing firm, the financial advantages may be considerable. One large corporation recently calculated that suggestions from workpeople were saving it nearly a million rupees per year. Moreover, these savings can be cumulative in the sense that a suggestion adopted in 1955 may still be saving the firm money in 1960. In smaller, particularly jobbing firms, suggestions do not always mean so much financially but there is ample testimony that managaments are convinced they pay off in higher efficiency, a better atmosphere and fewer industrial accidents.

Of course, it was not unknown in the past for a workman to make a helpful suggestion and to be paid a bonus for it. Too often, however, foremen and others tended to reply: "You mind your business". A properly conducted suggestions scheme is quite a different matter; for one thing it gives the employees certain specific rights:

1. The right of every employee to give free expression to his ideas on aspects of management or production, even in sectors which have nothing to do with his normal work.

2. The right to earn extra money by his ideas when these are outside his specific duties.

3. The right to expect that the management shall draw up a set of rules and a form of procedure which will prevent any arbitrary decisions in making awards for suggestions.

The objectives, however, of a suggestions scheme are not solely financial; they are intended to improve relations in the firm as well as the *morale* of the individual worker. And, as the case histories which follow will show, these aims are very satisfactorily achieved even in smaller firms. From the point of view of "getting the workers interested in the firm", a well-run suggestions scheme is certainly as effective as profit-sharing or a system of premiums. It induces a man to look beyond his little corner and see the works as a whole; it is an excellent means of removing certain inferiority complexes; and it may prove a sound guide to promotion.

One thing seems abundantly clear: when there is already a good atmosphere in a firm, the introduction of a suggestions scheme can only improve it. When the atmosphere is not too satisfactory, a suggestions scheme may prove helpful, but only if introduced with the greatest care. Otherwise, it is likely to be sabotaged by: i) the supervisory grades, specially at foreman level, who do not as a rule benefit greatly from the awards and who may consider that their position is undermined; ii) the workers themselves, who may regard the inven-

tors as 'black-legs" or "traitors" (specially when the suggestion is labour-saving), guilty of losing them their jobs or of forcing them to make unwelcome adjustments. The first difficulty can be overcome by carefully explaining the scheme and its connotations to the supervisory grades. As soon as they are convinced that suggestions put forward by the people under them will not be taken as reflecting on their own efficiency, but rather as a mark in their favour, they will even agree to encourage their people, and, in general, to support the scheme. The second problem is also one that must be—and can be— dealt with straight away. The best method is, no doubt, to include in the regulations governing the scheme a clause safeguarding the workers from any deterioration in their situation as a result of suggestions. Another device which has been tried with success is that of sharing out part of the award among the workers affected by the suggestion. Then again, by laying stress on suggestions making for fewer accidents, one can counteract the notion that suggestions schemes are run purely for the profit of management.

One sometimes meets the objection that the firm already has a drawing office, a planning office, a safety officer and so forth, and that they are perfectly competent to think out any improvements which may be necessary. The answer is that nobody can think of everything and that it is foolish to refuse the help of several hundred active brains who spend their days, right next to the job. Anyway, this objection gradually dissolves as a rule, once the scheme gets under way. It soon appears that most suggestions are outside the normal scope of the planning office and that the latter, chronically overworked as always, is not to be blamed for having overlooked this or that possibility.

Some suggestions are highly technical; after all, a man known to his employer merely as a lathe-minder may in his spare time be a locally-renowned photographer or model-builder. Other valuable suggestions are irritatingly simple, such as that of the workman who pointed out that it was costing his firm a lot more to make hinges for a particular assembly than it would cost to buy comparable hinges at the shop on the corner, since the firm in question used a million and a quarter of these hinges every year.

It is largely because *suggestions schemes introduce a further element of democracy into the firm* that they have given rise to such fierce controversy. The division between supporters and opponents is a perfectly simple one: all those who have made the effort to organise and run a proper scheme are wholly in favour of the idea; the opponents are those who have refused to try a scheme at all or who have been content to put up a suggestions box in some obscure corner—where it has harvested little but chocolate wrappings.

Let us look at some of the factors that have made suggestions schemes successful: (a) Top-level Support: A suggestions scheme will work only if it receives continuous support from top management. The suggestions committee or suggestions secretary, or whoever is running the scheme, must have the backing of authority; otherwise they will be dismissed as nuisances by some of the technical staff and their work will be given very low priority. (b) Maintaining Interest: It is equally essential to keep the worker's interest alive. This can be done by means of posters (though these must be changed at least monthly or they become too familiar to have any effect). A helpful arrangement which could usefully be tried elsewhere is the suggestions scheme poster service operated by the Industrial Welfare Society, London, which by printing off selected posters in very large numbers, is able to supply them to firms at low cost. The Society has also formed a Suggestions Scheme Group, com-

posed of suggestions schemes officers from some of the most go-ahead British firms.

The house magazine, if there is one, can be used to keep interest awake, and "before and after" pictures generally rouse a satisfactory interest. The number of suggestions submitted at the Ford Motor Company, Dagenham, went up after the appearance of items about the scheme in the works magazine. Another gimmick is to slip a reminder into the men's pay-packets; in one case this took the form of a match folder bearing a suggestions slogan. Several firms run interdepartmental competitions for the best number of accepted suggestions; the Lucas Group, for example, runs an inter-factory competition with various works moving up and down the scale in the manner of a football league. Results are posted up in all factories every month.

It is not only interest that needs to be maintained but acceptance and support at all levels. Experience has shown that the problems which arise are usually the same: 1. Fairness: To convince the worker that the scheme is run on fair lines generally rests on two factors: a. Workers' Representation; b. Fitting Awards. The first of these is that his representatives should sit on the committee adjudging suggestions. For some reason, most firms seem to have hit on the number of two as appropriate for the workers' representatives. The best results have been obtained when some degree of control over the scheme has been vested in a special body, either nominated by the Works Council or composed of an equal number of representatives of management and workers. This body should also be able to calculate with some accuracy how much the firm will save as a result of a given suggestion. b. Fitting Awards: The other essential factor is that the system by which awards are made should not seem stingy and should be simple to understand; awards must bear some apparent relationship to the savings which the firm is making. Where a suggestion concerns the time or labour spent on a job of production, assembly or handling, it is easy to calculate the savings attributable to the improvement. In such instances it has become fairly general for the award to be ten per cent of the estimated savings to the firm during the first year.

Where suggestions deal with better lighting, sound-proofing or safety measures, the gain to the firm may not be so readily calculable—unless there is a conspicuous rise in production or drop in the accident rate—but it may be very real for all that. In these instances the committee will have to make an arbitrary award and the only advice that can be given, based on the experience of a large number of firms, is that the award should err on the side of generosity. The idea that, by and large, no award should amount to less than one day's pay for a semi-skilled worker is gaining ground.

This brings us to the vexed question of "encouragement" awards given to a man whose suggestion has proved unacceptable for some reason or another, but to whom the management wishes to make some acknowledgement of his effort and ingenuity. The practice has sometimes been to offer a trifling sum of money in these instances, but many firms are beginning to question whether the modern worker does not feel slightly insulted by being given a small tip and some firms are abandoning, or have abandoned, the practice of "encouragement" awards. In addition to financial awards for employees who produce outstanding ideas for greater safety in the works, the Olivetti Company also encourages suggestions by giving additional prizes in the form of motor scooters, washing machines, radio and television sets, refrigerators etc. Prizes are displayed in a production shop at the Olivetti factory, at Ivrea, Italy, before be-

ing drawn for employees who have won awards during the previous six months.

2. Promptitude: Nothing discourages suggestors more than the absence of any news that their suggestion is being dealt with. It is a good practice to acknowledge the receipt of a suggestion in writing as soon as it has been opened. If it is taking more than two months, say, to deal with, it may be advisable to send the suggestor a little note to assure him that his suggestion has not been forgotten. All too often it is taking from eight months to a year to adjudge a suggestion and this period should be severely cut down.

3. Acceptability: It is generally agreed that a suggestion, to qualify for an award: a. must not come within the scope of the person's ordinary duties; b. must not be a repetition of an idea previously put forward, either by the firm's planning office, or by another suggestor. Some firms also specify that it must not come within the sphere of matters to be negotiated between the management and the unions. In dealing with marginal cases, one awards committee has hit upon the expedient of asking themselves: (i) Is this something which the man could be criticised for not having thought of? (ii) Is this something which he could have put into effect without applying to higher authority? If the answer to both these questions is "No", the suggestion can be considered.

4. Eligibility: Who is to be allowed to put forward suggestions? Are people in managerial positions to be excluded? In the immediate post-war years, when suggestions schemes were being more widely adopted, the general tendency seemed to be to exclude all those in supervisory posts, on the ground that they were paid to use their brains. Today, with the recognition that most supervisors are working in a very narrow, specialised field, the tendency is rather to consider almost everyone eligible to make suggestions outside his own sphere of duty.

5. Anonymity: On this question there has been and still remains a distinct cleavage between the firms which insist on concealing the suggestor's identity right up to the time of making the award — and even afterwards — and others which make a point of proclaiming the suggestor's identity all through. The argument of the first group is that a man may become unpopular with his workmates if he seems to be "putting himself forward." The second group argues that such resentment is unlikely, that everyone likes to be in the limelight and that nothing is more effective publicity for a suggestions scheme than to connect a technical improvement with the features and personality of someone familiar to many in the firm. It was noticeable that at a recent suggestions scheme conference, organised by the Industrial Welfare Society, most of the suggestions scheme officers present were opposed to the principle of anonymity, even when their managements continued to insist on it.

6. Procedure: As will be seen from the case histories which follow, procedures vary from a highly-organised system of suggestions boxes, forms and envelopes, to the casual handing-in of ideas written on any piece of paper. It appears that the actual procedure used is quite unimportant, provided that there is a person definitely responsible for seeing that suggestions are dealt with expeditiously and that the work-people are satisfied with the way their suggestions are handled and with the awards that are made.

Suggestions Schemes have so far been analysed on the assumption that it is not only a valid but accepted function of Management. It is worthwhile looking at the other side of the picture. In 1953 the case against Suggestion Schemes was stated as follows in the Report of the US National Industrial Conference Board: 1. Suggestion systems require a great deal of valuable

executive time and effort. 2. They can violate sound organisation by circumventing supervision. 3. Employees resent the steady ballyhoo and pressure which many feel must be exerted to secure sufficient suggestions. 4. It is an anti-scientific approach indicating the failure of management to plan and research properly.

These points have obviously little validity in view of the experience gained. In the engineering industry, and particularly in the large-scale mass production factory, there is plenty of evidence that such Schemes are economically worthwhile. In process firms and in the various "supply" industries (gas and electricity, for example), the scope for increasing productivity in this way is admittedly more limited, but it exists. More important, perhaps, are the psychological benefits: the provision of a properly administered method whereby employees can express their creative abilities, so often stifled by modern production methods; the provision of a two-way channel of communication; the creation of a cost-conscious working force; and a general tightening-up of management efficiency which is the inevitable outcome of their activities being thrown open to suggestions for improvement.

The tendency to underestimate the value of Suggestion Schemes often leads to their being allocated too lowly a place in the list of management functions. Indeed, Schemes may even be left outside the mainstream of management functions altogether. A firm may have accepted wholeheartedly the rest of the recognised techniques of modern scientific management, and yet not have accepted that the Suggestion Scheme is one of them. Even where this recognition does exist, it is often true that the function is merely tacked on to the main functions of the manager concerned. When this happens, it should not be surprising that the Scheme becomes moribund and more and more of a liability.

A Suggestion Scheme will not work or secure the results it is intended to, unless it is actively accepted by the Management and given a workable place in the whole system. Of course, the Suggestion Scheme cannot be placed in the management structure on purely economic considerations. The climate of opinion within the firm would materially affect the emphasis placed on the Scheme but just as a scheme is no substitute for good management in technical matters, it is certainly no substitute for good labour relations. The best way to look at the Suggestion Scheme is to treat it as a 'fringe benefit' in both the tangible and intangible sense. Nevertheless, the function is important enough to warrant the appointment of a full time administrator wherever possible and to give him the whole-hearted support of the highest level of management.

How do we start a Suggestion Scheme? The keynote is "Purpose". The basic reasons for having a Scheme must first be thought out, for there is a tremendous amount of loose thinking about its first principle. The motive behind starting a scheme often seems to be suspect. It would be "a good thing" or "so and so have started a Scheme, and so must we." Every firm, when it starts a Suggestion Scheme, must think out precisely as to what the purpose is in the context of its own working. A process firm, for example, where the average employee is not sufficiently technically minded and the equipment and production methods are beyond his control, a Suggestion Scheme on the lines of a mass production firm may be worse than useless. In such a firm emphasis had better been placed on the labour relations aspect and the general procedure should be geared to fit in with this.

The aspect needing the most careful attention in a suggestion Scheme is the award structure. The tendency in firms where there is not much scope for cost

saving ideas and therefore for big awards is for the Suggestions Scheme to become an outlet mainly for ideas for improving safety methods and welfare facilities. Such suggestions are often trivial and scarcely warrant the payment of awards of more than a few rupees. Unfortunately, this has its difficulties. In an attempt to make the Scheme successful, as many of the ideas as possible are accepted and awarded, until employees begin to expect awards for every trivial suggestion put forward which cannot be rejected out of hand. Thus there is a "debasing of the coinage" which gradually reduces the value of the Scheme. The award structure in such a case may well have to be considerably tightened, even if this means that many of the type of ideas previously found acceptable would no longer be put into effect. The firm would have to be prepared to make higher awards for the few really worth-while suggestions, even if there were no tangible cost savings. At the same time, the Scheme could be used *as a means of picking out potential candidates for promotion*, and this aspect could be emphasised as much as the possibility of winning cash awards. Whatever the emphasis, however, the management must be clear what the purpose of the Scheme is and plan accordingly.

When discussing firms in which cost reduction is the main aim, and labour relations benefits only secondary, there is no less a need for clear thinking and careful planning (although it is probably easier to "muddle through" successfully). Management still has the responsibility of ensuring that the Scheme does what it sets out to do in the most effective way, and this should not be left to chance, and an inadequate organisation lacking full top management support.

As for eligibility, this is really not as easy a question as it looks. What may be perfectly sound policy for one firm may kill another firm's Scheme as soon as it is launched, if applied "neat". The policy to be adopted must be one which will help to produce the desired result. It would seem to be ridiculous, for instance, to debar chemists from a Scheme in a firm in which the majority of employees are chemists. It should surely be a cardinal principle that as few people as possible should be debarred, and the way in which this is achieved will obviously differ from firm to firm.

As for awards, the actual practices differ widely. Actually this aspect of running suggestions schemes has not been carefully thought out, but instituted arbitrarily, often taking other firms as a standard. The IWS survey revealed one thing above all others: that scales of awards are dismally low. Apart from the theoretical argument about whether a niggardly award structure is equitable—a fair return for ideas submitted—there is the question whether such a structure achieves what it should. An award scale should aim to provide awards which will definitely encourage the submission of further ideas, as well as reward them fairly, and this means, in these days of cheap money, having a fairy generous scale. It just cannot be laid down what is or is not a fair Scheme but the payment of five or ten rupee awards would show a complete lack of awareness of the purpose of an award. If the firm concerned is small and the total saving from any one idea is never likely to be high, the scale of awards may have to be based on the whole of the first year's savings and so on. Only a careful survey of the individual firm's situation and comparisons with firms in a similar position would indicate the type of scale to be adopted. It is assumed here that awards should be linked directly to cost savings when such savings are calculable. There appears to be no justification for any other method. If a firm is prepared to instal a Suggestion Scheme, it should be prepared to

accept all that this entails, even the paying out of large sums of money.

The more important point is that the suggestion scheme should be an integral part of a carefully planned structure. A firm in which joint consultation is wholly accepted on most aspects of management, as it affects the employees, should obviously integrate the Suggestion Scheme Committee structure with the various other committees already functioning with employee representation. Of course, many schemes work quite satisfactorily without this representation.

We may now consider certain specific experiences. First, the *German Experience* : In Germany, some firms pay a nominal amount of five to ten DM for suggestions that cannot be used. Other firms give small amounts, as for example, ten to fifteen DM, if it is evident that the author has made a commendable effort. Some firms give as encouragement small objects such as pocket knives, fountain-pens, sewing kits, lighters or books. These are awards in recognition of effort, although the suggestions offered cannot be accepted. Where the economic benefit can be determined, there is a varving percentage paid to the authors of the suggestions, anywhere from six to twenty-five per cent of the amount annually saved. Where the expenditure for material, appliances etc., is deducted from the total amount saved— this is done in most cases, the percentage varies, going up in certain cases even to 50%. An Austrian firm has a schedule ranging from 20% for annual savings up to 500 Schilling, down to 10% for over two thousand Schilling. Another firm pays the total saving for one month. One group of firms does not calculate the amount saved but simply classifies suggestions as follows and pavs from 20 to 200 DM according to its place in the classification : 0. Suggestions that have to be rejected because useless. I. Suggestions proving a personal endeavour made by the author and therefore eligible for recognition. The suggestion does not improve the actual state of operations. II. Suggestions which are good but cannot be exploited for reasons beyond the author's knowledge. III. Suggestions which are good but do not permit the determination of economic benefits. They include most suggestions for the improvement of accident prevention and simplification of work. IV Suggestions, the economic benefits of which can be determined but which are only a good idea that has to be developed by the firm before it can be applied. V. Suggestions, the economic value of which is obvious and which can at once be applied. VI. Suggestions ready to be patented for exclusive use by the firm concerned. VII. Suggestions ready to be patented for use by their own and by other firms.

In cases where the economic benefits cannot be determined, the suggestions are classified as follows, with the awards stated in brackets (a) Suggestions representing a well-meant criticism of existing conditions but without useful proposals for improvement (10-20 DM) (b) Suggestions criticising existing conditions which have to be reviewed by the competent executive but which do not lead to effective improvements. (20-50 DM). (c) Suggestions which after further elaboration lead to improvements. They show the author's intelligence but can only be implemented after revision by the responsible executive. (50-100 DM.) (d) Suggestions which not only demonstrate the need for improvements but contain definite proposals which have only to be checked by the expert in charge.

Certain German firms have a points system : maximum of 20 points for financially imponderable benefits from simplification of operations, prevention of accidents, embellishment of the plant, reduction of waste, improvement of quality, streamlining of the organisation, care of tools and machinery etc.;

maximum of 50 points for benefits of economic value, resulting from saving of labour, materials, operating expenses etc. A monthly saving of 50 DM. is equal to one point. The resulting number of points is not final. It depends upon the field of application, the position of the suggestor and the novelty of the suggestion. On the basis of a complex formula, the number of points is multiplied by a co-efficient. Firms, paying a certaing percentage of annual savings, also make a distinction on the basis of sex and position. A firm, for example, pays 20% of annual savings to female labour, 15% to male labour, 12.5% to foremen and 10% to supervisors. A more generous firm pays 100% to unskilled labour, 90% to skilled labour, 70% to foremen and 50% to supervisors.

Though these cases throw light only on a small section of the German industrial structure, it is probably true that the extraordinary economic success of German industry is in part due to the techniques by which it taps the intellectual reserves of its working class; and suggestions scheme is one of the techniques employed.

One small peculiarity of the German experience in this connection may be mentioned from the point of view of social interest. The proportion of women employed in Germany has risen to one-third and is still growing but it has been found that in nearly all firms, women play far too small a part in making suggestions. In 50 large German undertakings, only 7% suggestions came from women, although in some of these firms women represented more than half the total labour force. Many reasons have been advanced for this but the subject cannot be adequately dealt with here for reasons of space.

The *French Experience*, as evidenced in the case of the Arthur Martin Company at Revin and Rheims, (manufacturing kitchen equipment, gas, electric and coal heating systems) is obviously a little more interesting. This firm has an outstanding reputation for human relations; and when a suggestions scheme was to be introduced, some of its opponents argued that it might spoil the good relations between foremen and workers. That did not happen but the procedure adopted by the firm is really novel. There is no suggestion box. Instead a man has been chosen with the essential qualifications: he must be well-known throughout the works and he must possess those diplomatic and psychological qualities acquired only through long experience. The obvious man for the job is the security engineer whose duties entail constant tours of the works so that he is already a familiar figure. There is no set procedure for handing in a suggestion. The suggestor can give it to the officer when he makes his rounds or pass it on to his foreman or shift boss. Shy people can just slip it under the office door. Forms are not compulsory, though some special forms are provided for those who like to use them. The only condition is that the signature must be legible.

In principle, neither foremen nor executives are supposed to take part. They should merely help their workers to explain their own ideas, or perhaps say the key-word which will lead to the formation of an idea. The management admit that executives did not become generous and self-effacing in a day and they can tell of obstinate refusals to co-operate at the beginning. It required tenacity not to abandon the scheme, but now that the obstacles have been overcome, it has gradually drawn the men closer together, rather than driving them apart. The fact that anonymity is not permitted has done much towards fostering in the supervisory ranks a spirit of loyalty and mutual aid towards their subordinates.

Leaving out supervisors and foremen, the personnel are divided into two groups. Those in the first group, composed of workers and junior office staff,

receive 25% of the amount saved annually through their suggestions. The second group is composed of technicians (from the planning and control offices and laboratories), who receive only 10%, since it is considered that they have more scope for discovering ideas and that, after all, it is practically part of their job. Lastly, for the product development office there is a much tighter system; they are on a descending scale of 10% to 3%. The rate 10% is applied if the idea is definitely not connected with the author's work; 7.5%, if it bears some slight relation to his work; and 3% if it falls within his normal duties, even though not part of the daily routine. It is planned to extend this triple scale to the whole staff and if it is adopted, the management would pay 25% of the amount saved in each case, the difference between this sum and the award to the author, being paid into a reserve fund to be used, for example, for prizes and end-of-year share-outs. Awards are also proposed for suggestions which have resulted in improvements but whose value cannot immediately be assessed, e.g. those which have brought about improved working conditions.

The Arthur Martin Organisation has organised publicity in its own way: (a) slips showing, for example, the amount of awards distributed over the preceding year are inserted in pay packets from time to time. (b) The works magazine and fortnightly newssheet give news of how the system is progressing (overall results, sensational ideas etc.). (c) Suggestion competitions of various types are organised. The most ingenious was a "holiday competition" which opened in May last with a prospectus showing some one having the holiday of his dreams, thanks to the award he had received. Three prizes were offered in both of the groups, the first being a double bonus, the second a 60% increase on the bonus, and the third a 20% increase. As the first prize in the first group (workmen) was 96,365 francs, the competition was a success. It was for a new way of stowing the firm's products in railway trucks. Incidentally, the French Railways were able to make use of this elsewhere—a good example of a suggestion, of use to more than a single firm. In spite of the lower rate applied (10% instead of 25%) the first prize for the second group was as much as 171,252 francs. (d) The management believe that the best way to keep the suggestion Scheme alive is still the frequent visits to the workshops of the "suggestion man", whose presence starts off a visual association of ideas.

In this organisation complaints and suspicions are dealt with effectively by a most democratic procedure by which a worker can go up to anybody and convince himself that he has been fairly treated. Probably the author is explained that he has put his idea wrongly and is shown how to resubmit it. A register and a chart showing the status of each suggestion are kept by the suggestion secretariat.

One final problem remains to be solved : that of ideas, such as those affecting the workbench itself, not being submitted because the suggestor fears, rightly or wrongly, that they will give rise to antagonism among his colleagues. He realises that it will involve new stopwatch tests, cutting down of time allowed for jobs, and altogether unfavourable first reactions. The suggestions service has on its files a draft scheme for making it possible to tap this undoubtedly rich source of ideas. This would consist in awarding 50% of the annual saving effected and sharing it out as follows : 15% to the suggestor himself and 35% amongst the team concerned, including the suggestor. This scheme, however, has yet to be put into practice.

The most significant commentary on this case study would be the citation of simple statistics. Due to suggestions received from workers, the annual savings

to the company rose in the period 1953 to 1956 from 0.3 to nearly 17 million francs and the awards to the workers rose from 69,000 to 2.8 million in the same period. Suggestions from technical departments resulted in a saving to the company of nearly 15 million francs in 1956, of which they paid 1.2 million francs as awards. Taking workers and technicians together, the company saved in 1956, from the implementation of suggestions, a sum of over 31 million francs, of which they paid 4 million francs to suggestors.

Another case study from France is equally, if not more significant. The French firm of Alsthom-Lecourbe in Paris has really done quite a good deal of research in Suggestions Scheme itself. In the very middle of the workshop there is a workroom, kept open continuously day and night, even outside working hours. In this room, an 'idea box' is available in which 'inventors' record and sign their suggestions. The expected annual saving is calculated, and up to 10,000 francs is wholly and immediately paid to the suggestor. Another interesting point is about suggestions for work simplification. They frequently mean a reduction in standard times, which may produce an undesirable psychological reaction from the workers affected and workers may even refrain from making suggestions because they do not wish to be unpopular. To forstall this, it is a part of the system that workers, whose standard times are reduced, receive a share of the expected saving. Further the new standard time is increased by 20% within the limits of the old time. In five years, this company has received over 4000 suggestions and accepted 31%, with an aggregate saving of some 38 millions francs, based on an average of 2 years' use for each suggestion. Another interesting point is that the authors of suggestions constitute 50% of the staff covered by the Scheme.

The Swiss Experience: Sulzer (manufacturers of diesel engines, turbines, refrigeration plant etc.), is one of the largest firms in Switzerland. A suggestion Scheme has been operating in this company since October 1954 and is in principle open to all the staff. There is a Suggestions Committee, consisting of the General Manager (Chairman), a Shop Supervisor (Vice-chairman), Head of the Suggestions Service (Secretary)—all ex-officio members, two members of the Productivity Working Party of the Works Council, a forman from the Assembly Department, another from the Foundry Department, a worker from the Assembly Department and an Accountant. Of these last four, two must be members of the staff association. Awards are based on the saving expected in the first year of application and represent either 15% of the gross saving or 25% of the gross saving less development costs (whichever is the smaller). A bonus is granted for good presentation. The award is never less than 20, nor more than 5,000 Swiss francs. When it is impossible to calculate the potential saving, the Head of the Suggestions Service proposes an arbitrary award. Good suggestions which cannot be put into practice in existing production conditions receive a consolation prize of at least 20 Swiss francs. All awards must be paid within two weeks of the decision. If a rejected suggestion is put into effect later, the author is entitled to an award. This case study also shows a net saving to the company. It also reveals another important point: piece workers make more and better suggestions than weekly and monthly paid staff.

The Belgian Experience is also worthwhile going over. The Business Management Research Centre of the University of Louvian sent a *questionnaire* to 156 Belgian firms, one third of which were operating Suggestion Schemes , 50 p.c. particularly constructive. The Centre has on that basis drawn up a report, enumerating the

conditions necessary for launching a sugggestion scheme: satisfactory social climate, top management backing, plan of action, enthusiastic organiser, co-operation of middle management. Special attention has to be paid to the means used for informing the staff. The most popular media are posters, house journals and works councils. Some critics asserted that even if a suggestion scheme was a success in the first year, it would probably fade away to almost nothing in the second year. The figures for ten Belgian firms do not bear out this criticism. The authors of the Report point out that the most frequent causes of failure are inadequate preparation of the staff and insufficient publicity.

A Norwegian case-study, similar in its significance to the general European experience, has one special point: a paper-making firm (M Peterson & Son, Moss) has a special Contact Man, who rewrites the suggestions in his own words, partly in the interest of anonymity, partly for the sake of lucidity. Later, when a suggestion actually proves fruitful, an award is given and reported alongside a photograph of the successful suggestor, in the firm's quarterly house organ.

The conclusions advanced above may be supported by two other case studies of an English and an Australian Company. In the firm of Lucas, all employees below the status of under-foreman may participate in the Suggestions Scheme. In 1958, 33,000 eligible workpeople submitted 10.200 suggestions, giving a ratio approaching 1 :3. Of the suggestions received, almost a third were adopted and £17,300 was paid in awards. Administration of the Suggestion Schemes is decentralised, each factory having its own Suggestion Committee of 16 members, 9 representing employees and 7 representing management. The Factory Suggestions Committee may award upto £100 for any one adopted suggestion. They may also make *merit* awards for suggestions which though not adopted reveal careful and ingenious thinking.

The Suggestion Boxes, which are prominently placed at factory main gateways, have been designed to serve three purposes. The lower half of the box holds blank suggestion forms which can be detached at will, the upper half serves as post-box for completed forms, while the small notice case, which is integral with the box, is provided to hold the lists which are regularly posted to inform suggestors that their letters-of-reply are available for collection. Thus, the suggestion box is made the focal point of the scheme for employees, since it is there that they go to draw their forms, to post them when completed, and to check whether an answer awaits them. Anyone not satisfied with reasons given for the rejection of his idea may ask for a re-investigation. At the end of every year, each Factory Suggestion Committee reviews all suggestions adopted during the preceding 12 months and recommends those considered worthy of a further award. A suggestion may be recommended as the best received on the particular subject (fuel economy, materials economy, safety etc) or perhaps as being the best submitted by a woman. On a stated day, all recommended suggestions from throughout the Organisation are brought together and laid out, using models or examples in appropriate cases, for the Directors to study. An additional award is then decided by the Directors for the ideas they consider to be of special merit. These Directors' Awards, as they are known, are always very substantial additions to the original awards. Very often a Committee award of £100 will be repeated, and only rarely is an additional award below £25. The suggestion which the Directors judge to be the best of all submitted during the year under review usually earns its originator an additional award of £250. In

1958, the best suggestion was considered to be of exceptional merit and an award of £500 was made. In June 1959, an inter-factory competition based on suggestion scheme successes was started. The incentive offered was that all those in the winning factory whose suggestions had contributed to the success would have their original awards repeated. Interest was maintained throughout the competition period by the wide display each month of posters showing current League placings. The effects of this competition have proved notable. The winning factory achieved the very creditable result of one adopted suggestion to every 2.83 workpeople, and more than half the competing factories finished with ratios better than 1: 12. The League is being continued in substantially the same form, but the conditions this year have been altered to stimulate the flow of ideas aimed at achieving a definite economic advantage. Thus, adopted suggestions which bring about an economy in material will qualify for two points, whereas all others will be awarded one.

An Australian Case-study: The Suggestion Scheme of an Australian firm, Monsanto Chemicals, excludes directors, managers and members of the Suggestions Committee from the operation of the scheme. Interest in the scheme is fostered by (a) posting on notice boards the result of suggestions submitted, (b) the eye-catching suggestion form, (c) the speed of decision on most of the suggestions, (d) encouragement awards, (e) articles in the house magazine, (f) an attractively arranged booklet which is given to all employees during their induction period, (g) brightly painted suggestion boxes and (h) posters which are changed at regular intervals.

The more interesting point about this case study is the research done in the attitudes of various grades of staff to the operation of Suggestion Scheme. This may be summarised as follows: (a) Attitude of Senior Supervisory Staff: Supervisors generally thought that the purpose of the scheme was to give employees an opportunity to think constructively about their work and to help improve production methods. Their overall view was that the scheme was achieving this purpose. However, a small number of them were very firmly of the opinion that the scheme had not produced good usable ideas, that it cost the company more than it returned, and that it wasted their time because they had to assess suggestions. Many of the supervisors in fact tended to think that awards were somewhat over-generous. They commented on the difficulty of making a fair assessment of savings on most suggestions. They were frequently critical of the large number of encouragement awards. Nevertheless, most thought that dealing with suggestions was well worth the time involved, which usually amounted to only an hour or so. It would be very rare that a suggestion would remain in their hands for longer than a week. Only one supervisor thought the scheme affected his position adversely. In his opinion, too many employees were spending their time "working-up" suggestions rather than doing their proper job. Only two thought the scheme was not worth continuing. Two others considered that employees were becoming dissatisfied because of the length of time taken to decide on a suggestion. Generally speaking, supervisors considered that employees were highly satisfied with the scheme. Supervisors appointed since the introduction of the scheme had had difficulty in getting information about their responsibiity regarding assessments. They felt they should not have had to seek out this information.

(b) **Attitudes of Operatives**: Apart from uncertainty about the eligibility of suggestions, operatives were very well informed about the scheme. However, on the question of eligibility they were most uncertain and concerned.

Very few understood why their suggestions were ruled ineligible. Most thought that any suggestion connected with their own work was ineligible. Most considered that it was unfair that suggestions should be ruled as ineligible at all. They generally considered that awards for accepted suggestions were fairly related to the value of the suggestions. About 20 per cent considered that suggestions were consistently under-valued, and that the company was getting more than it paid out. There was a certain amount of cynicism about encouragement awards, which were described as "easy money". This feeling was not widespread. Only a few did not consider that supervisors assessed suggestions fairly. These few generally had not had much success with suggestions they had submitted. A small number had asked their supervisors to help them with their suggestions. The response of the supervisors concerned had varied, but was usually unfavourable. About half the operatives were in favour and half were against the idea of employee representation on the committee. There was a certain amount of feeling that there should be at least an appeal body with employee representatives. This was tied in with the general environment of employer-employee cooperation and consultation which exists at Monsanto. In fact the suggestion scheme was frequently seen as an inevitable result of such an environment. Only a very few operatives were against signing their names to their suggestions. Those opposed to it again came from a small group who had had little success with their suggestions, and attributed this to their own personal unpopularity with some person in authority. Most employees felt very strongly that too much time elapsed between the submission and finalisation of suggestions, and most put forward actual examples of long delays. They felt that it showed management was not as interested in the scheme as it claimed. It appears that some notification of progress, at least, would have been welcome. There was some feeling that suggestors should be notified individually of the decision about their suggestions, because many would forget their numbers by the time a decision was announced. Most considered that the company mainly wanted suggestions to improve efficiency and was not particularly interested in welfare suggestions. In any case there were other avenues for bringing forward welfare matters. Management, it was thought, had achieved its purpose with the scheme. There was almost universal agreement that the idea of suggestion schemes was good. The reasons given for this approval were mainly that the worker was encouraged to think about his job, work interest was created, the worker could make money from his ideas, the job was made easier, and conditions were improved.

We may now take the case of a Suggestion Scheme in a public service. The South Eastern Electricity Board (called Seeboard) operates in South Eastern England for distributing and selling electricity to people. It also has a secondary job of selling electrical appliances and fittings, and doing electrical contracting work. The Seeboard has been running a Suggestion Scheme for nearly 10 years, though it is really difficult and costly because of the size and widely dispersed nature of the organisation. The Scheme has in the first instance to be "sold" to over 26 district managers spread over a very wide area, ranging from two to nearly hundred miles from headquarters. There is on the other hand no large concentration of employees at any one point. Most of the depots have fewer than 100 people and in some there are only a handful. Publicity is difficult: in a factory a dozen posters may be enough, this company needs over 300. The scope for suggestions is also limited in the

selling of electricity, regulated to rigid specifications. To suggest changes needs a very high degree of technical knowledge. This company does not produce electricity but only sells it, and there is not much scope for suggestions in reading meters or digging roads. Further there is a great deal of standardization of methods and processes which tends to limit the scope for suggestions. The nature of the business just does not lend itself to startling change. However, there is a fair amount of room for relatively minor improvements, for example, for smoothing of rough edges and rounding the sharp corners. Yet this company has a Suggestion Scheme in which everybody (99% of the staff) is eligible except the managerial grades. The reason for that is the desire 'to get a spread of good ideas'. The Suggestion Scheme provides a recognised channel for getting the sought for spread of ideas. Assuming the idea to be a part of a man's job, he would not get an award for the adoption in his own district; but he would be eligible for an award, if the idea spreads to other districts. The company found it difficult to fix up an awards system for it was not practicable to assess with any reasonable degree of accuracy how much the company saved in each case. In fact, for many suggestions, there is no monetary saving, the only justification being a better job or a better service done. Some suggestions actually cost money to implement. Wherever possible the company does pay a proportion of the first year's estimated net saving, the proportion varying according to the originality, man's job and seniority. But for the most part, the company relies on a royalty method. If a man's idea is adopted in his own district, he gets an initial award of at least £1 plus a royalty of at least 2 sh. 6d. for every other district in which it is used. This could produce a total of about £4 for a suggestion of the most minor character if it were used in every district. But it is possible to give an initial award of say £5 for a good idea plus a royalty of £1 for each district in which the idea was adopted. The initial award would be paid right away. The company would circulate the idea to all other districts, and if it was adopted, the total award would amount to £30. An annual review is held—extending back two years each time—to make sure that everybody gets what he is entitled to. This, like any other system, may look arbitrary in its operation but the employee is convinced that the company is trying to give him a fair deal, the award being directly proportional to the use of the suggestion. The initial award is higher than the royalty to recompense the employee immediately for thought and trouble he has put into the suggestion and sometimes for the expenditure he incurs. The initial award ranges from a minimum of £1 to a normal maximum of £50. For special awards, employees are entertained at headquarters and the Chairman makes the presentation. There is another aspect of this company's Suggestion Scheme, namely, a nation-wide pooling of the best suggestions from all the electricity boards in the country. *There is a central body which acts as a clearing house for the best ideas*, and also gives additional awards at the top of what the company gives. *This pooling of ideas probably could not apply in private enterprise (production of electricity in UK is nationalised) because the entrepreneurs would not be willing to give away their secrets but it could be developed in public services.*

Another point about the Seaboard scheme may be mentioned. In every district there is a Suggestion Scheme local representative who helps suggestors develop their ideas and put them over, get drawings done and proto-types produced, if necessary; in some cases even to help improve the suggestion by knocking off the rough edges. The company has also a patents scheme in which

the employee can apply for patent rights if he so chooses and failing there, he could come back under the Suggestions Scheme. Such applications, however, are relatively few and even fewer are successful. This company has no Suggestion Committee. Each suggestion is considered and reported on by three assessors: a district manager or departmental chief, a sub-area representative and a specialist officer at headquarters, who make recommendations. The Chairman decides on the basis of the reports whether an award shall be made and how much it shall be. What may appear more remarkable is that this company has been using 40 to 50% of the suggestions received.

Probably some details of how to work a Suggestion Scheme may be useful. The following is the Introduction to a booklet for employees published by a European manufacturer of electrical appliances: *"No, you are not just a cog in the wheel! We value your opinion...* The success of our firm matters to you, for you will share in its profits which are divided equally between shareholders and workers by means of the collective work bonus....By helping us to lower costs, you enable us to give better service to our customers and to guarantee you full employment...." The booklet contains two questionnaires to help workers to set about finding suggestions. They are reproduced below: 1. *Questionnaire for shop and production staff*: Can I eliminate an operation—costly, unsuitable or useless equipment—unnecessary or difficult handling —hold-ups (material, equipment, papers)—waste of material or energy—unnecessary forms—maintenance costs—accident hazards?.... Can I combine operations — equipment — handling — forms?....Can I improve the running of any parts of a machine—the manufacture of components in order to simplify production and assembly, avoid retouching or ensure interchangeability—the layout of machines equipment, work stations (shops and offices)—manufacturing equipment — working conditions—administrative and control procedure?.... Can I change a complicated operation into a simple one—a manual operation into a mechanical one—a movement sequence into another to avoid idle time—out-of-date methods into modern ones with proper preparation and control devices?

2. *Questionnaire for all office staff*: Can I eliminate a rush job—an unnecessary job (recopying, duplication)—an unnecessary or ineffective form—a hold-up—maintenance or office costs? ...Can I combine forms—similar jobs done by different persons—movements—handling?....Can I improve the efficiency of a job—administrative procedure—the layout of my work station—*liaison* and coordination with other services?....Can I change a manual operation into a mechanical one—an old method into a modern one—a complex job into a simpler one etc....?

To sum up, the suggestion scheme enables a worker to increase personal income; help to raise the collective works bonus; put an end to errors or waste which shock professional conscience; carry out personal ideas; give the management and immediate boss a chance to appreciate professional knowledge, initiative, ingenuity and common sense; above all, to secure recognition of workers' talent. A suggestions Scheme is one of the tried techniques for tapping this infinite source of intimate knowledge of tools and methods.

There's always a better way !

Concept & Measurement of Productivity

B B LAL*

In order to ensure rational conduct of industry, there is obvious need to make definite appraisals of industrial inputs and outputs in both physical and financial terms. Without such appraisals, or micro-macro input-output analyses, it would be difficult to avoid and eliminate the material poverty that is caused by the prolongation of wasteful application of scarce resources.

The main objective of the productivity-drive or of any other economic drive should be to create conditions of material prosperity; and with a view to focussing upon productivity, it is, as such, necessary to analyse and activise the production factors, on which such prosperity depends, to ensure (1) rational allocation of the available resources between their alternative uses, as well as (2) the most productive utilisation of the resources, so allocated. In a productivity-conscious community, right allocation of resources, as also their most productive utilisation, are both rather simultaneously and almost automatically achieved. But in under-developed economies, which are either handicapped in being, or are not productivity-conscious in right earnest, the most productive patterns of allocation and utilisation of resources have to be deliberately sought after, through centralised 'planning'. The link of planning, however, practically breaks down when the level of the individual (private) firm in such economies is reached; and it is indeed at the plant-level and the firm-level that an under-developed economy is particularly weak and needs comprehensive analysis.

'PRODUCTIVITY'[1] refers to the production-rate of a given output per unit of the relative 'input' (or inputs)[2] under given conditions and time.[3] It is, in other words, the ratio of a specified or well-defined output to the corresponding input, i.e. the resource employed to get that output.

A productivity-conscious production-unit tries so to improve or increase the contribution of the production-factors, available to it for use, as to make its overall result (say, in terms of 'net values added') much more valuable than the aggregate costs incurred in employing such factors. But increases in the

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1. It is not the concept of marginal but that of 'average' productivity that has been elaborated herein. While making productivity-studies, say, relating to labour, we are interested primarily in measuring and comparing the average, and not the marginal, out-puts per man-hour. It should be, however noted that a national productivity-movement would lead, over time, to most gainful employment, or fairest possible rewards, of all the inputs in every component part of the national economy; and this will automatically tend to equi-marginalise the factor-productivities and rewards all over the country concerned.

2. The concept of productivity centres generally around promotion and measurement of the relative output per unit of a given input that may fall in one of the following categories: 1. Man-hours (or labour) 2. Fixed assets 3. Other investments 4. Materials 5. Horsepower 6. Managerial efforts. Productivity may also be indicated by measuring the input or inputs per unit of the relative output. It should be noted that productivity of an input improves when the output per unit of that input increases quantitatively and o qualitatively.

3. In fact, 'productivity' gives us an idea of the extent of effectiveness achieved by the relative production-factors or units and connotes the class of conceivable measures depicting output per unit of the associated inputs in a sequence of comparable periods.

volume or value of production and in those of 'productivity' may not be positively correlated to each other; and they are certainly not identical[4]. Further, the associated inputs do not necessarily register simultaneous increases in efficiency and productivity.[5] Besides, the concerns and responses of the suppliers and users of both the inputs and outputs show marked variations, and this gives rise to multiple input -output relationships, under varying market-pressures and conditions[6]. The concept of 'productivity' has to take full account of such variations.

As the input-output relationships are evaluated with varying degrees of concern by different interests (that is, employers or risk-bearers, workers, employees, consumers, middlemen, and the State), a single clear-cut concept of productivity cannot be advanced. Moreover, the meaning of 'productivity' varies according to whether gross (or net) specific productivity, or overall or integral productivity at the plant-level, or for a given industry, or for the entire national economy is being studied and measured.

Since productivity, as input-output ratio, is obviously the most important determinant of the national product, and the 'National Income' analysis is being increasingly applied to the shaping of fiscal policies and economic plans, uses of detailed studies (micro-macro) aiming at accurate measurement of productivity have become necessary in order to determine or forecast the national income and output levels, employment trends, occupational shifts, resource requirements, and wage-profit-price adjustments. It is, in fact, only by regularly measuring and comparing the productivities of production-units and inputs that a critical judgment can be passed on the overall national product. But production-measurements

4. Production may be increased by employing more, but not necessarily by enhancing the productivities of factors whereas the absolute productivity, *i.e.*, the self-achieved one (and not the 'apparent' productivity, *i.e.*, the one achieved with the aid of the cooperant factors) of an input can be increased only by improving its efficiency, and not necessarily by increasing its quantity employed in the production concerned. An expansion of production is possible also by installing new plants adopting the same traditional production methods as do not result in any increase in the output per man-hour (or per unit of capital) or may not fulfil the given production target at lower than traditional costs. Production may also be increased by using more intensively, yet more expensively the production factors. The results in such cases would be obviously reflected upon by reductions in the productivities of the factors concerned.

5. For example, the workers, operating on a certain model of a machine, will double their current 'output per man-hour' level after they are supplied with a new model possessing double production-capacity in comparison to the old model. This innovation will bring about an increase in the apparent productivity of the labour, and also of the capital (if the capital-costs do not go up, or go up less than proportionately in comparison to the resulting output), but not simultaneous increases in their efficiencies. The efficiency of capital inputs only would be said to have improved in this case and not that of the labour (which is, no doubt, assumed herein to be putting in the same quantity of effort after the innovation at the same cost within the same time, as heretofore). The productivity-increase registered without simultaneous increase in the efficiency of the factor (whose productivity rises) is not a 'real' but an 'apparent' one ; and, it should be noted, it is only by ensuring increases in real productivities (that is, efficiencies translated into practice) of the factors that lasting economic growth with a gathering and self-sustaining momentum can be brought about.

6. The costs, quantity and quality of some inputs like labour and materials are adjusted generally to the relatively short-term variations in output-levels and of others like capital and managerial services primarily to the long-term variations. Productivity-adjustments are made either mainly between the inputs, or only among the outputs, or simultaneously between both, and this gives rise to the problems of measurement of variations and relationships between the components of the production-process concerned. The relationships—individual and combined—that exist and subsist between the diverse inputs and out-puts may however, be expressed either in financial or physical terms and it is meaningful measurements of such relationships that the concept of productivity explores. Moreover, as the inputs (and also the outputs) are of different forms, sizes, compositions, and capacities and are in most cases inseparably inter-linked, a precise evaluation of their individual costs, quantums, and contributions undoubtedly presents complications ; and it is the removal of such complications that the concept of industrial productivity is mainly concerned with. In short, a productivity-study cannot be precise and effective without identifying and removing such difficulties as are encountered in measuring and comparing the relationships between given inputs and outputs.

cannot be reliably made so long as measures are not taken to ensure preparation, by the production-units, of standardised cost-accounts. After introduction of cost-accounting on a wide scale, via determination by the firms of 'standard' costs, productivity-measurements can be made and combined in such ways as will make it easy to determine the best conditions necessary for regularity in the functioning not only of the individual production-units but also of the whole economy.

The concept of productivity obviously needs a good deal of clarity to avoid vague generalisations about the changes in, and potentialities of, productivity-structures. Moreover, it should also have been noted that 'productivity' and efficiency' are not identical variables, for whereas 'efficiency' connotes the competence or capacity of a given input or production-unit to produce under given conditions the result intended, 'productivity' refers to the actual results produced by an input or production-line under given conditions within a given time at given costs. We have already pointed out that it is quite possible to increase the apparent productivity (that is, the productivity resulting from association with other inputs) of a given input without any improvement in its efficiency. Conversely, the efficiency of an input may increase without any simultaneous improvement in its productivity. "Labour Productivity indices do not reveal changes in the intrinsic efficiency of labour, but rather, the changing effectiveness with which labour is utilised in conjunction with other factors."[7]

The productivity of labour is, in fact, an outcome of the cumulative operation of a large number of separate though inter-related factors like the factor-proportions, the utilisation-rate of the production-capacity, the attitude of the labour, etc. The Committee on Price Determination, New York (vide its 'Cost Behaviour and Price Policy' 1943) has rightly characterised the mere 'output-man-hour' ratio to be rather misleading in so far as this ratio fails to include the inputs of other elements of production combined with the labour concerned. It is, therefore, after calculation of the 'total labour' (that is, the visible labour plus the 'embodied' or 'incorporated' labour) that 'labour-productivity' can gain a measure of clarity, for the 'embodied' labour is an equivalent measure (in terms of man-hours) of the inputs associated with the visible labour. (This concept has also been advocated in the survey on 'Productivity and Employment in Selected Industries' made cooperatively by WPA National Research Project and the National Bureau of Economic Research, USA.)

There is, however, some difficulty in reducing some of the basic elements having no easily-determinable labour-content (as, for example, invested capital or risk-bearing) into their 'labour-qeuivalent' measures; and, as such even the 'total labour' time (the actual plus the embodied) cannot be treated as an exact indicator of the changes in the 'total inputs'. Nevertheless, the visible labour-input enjoys prominence over the other inputs, because of (1) its comparatively greater amenability to measurement, (2) the relevance of its productivity to employment-cum-income trends and production-costs, and (3) its key-role in the society seeking after maximum possible material welfare with best possible voluntary leisure; and, as such, the contributions of this input when measured do reflect upon the material state of the society concerned, with sufficient degree of meaningfulness. Moreover, as inputs, the 'man-hours' are comparatively more homogenous than the other inputs. But the roles of technology, materials, power, capital items, in-

7. Siegel, I.H. Concept and Measurement of Production and Productivity, Washington, 1952, p. 21.

dustrial research, and management are ever increasing in the production-function, and visible labour-productivity alone cannot, as such, approach to be a good approximation of all-factor productivity, particularly in the short-run.

MEASUREMENT

The need to explore precise measurements for determining the direction and extent of the various input-output relationships and the adjustments therein for testing the rationality of resource-application cannot be over-emphasised. There is also the necessity of a thorough screening of the causes and effects of the changes in the various input-output relationships with a view to locating the bottlenecks and the potentialities of the national economy. Different emphases upon the financial or physical aspects of productivity-measurements are put upon for different purposes by the suppliers and the users of both the inputs and the outputs, and the more so, because of the market-imperfections. Besides, the resource-supplying interests, interested in the broad-based problems affecting the utilisation and allocation of the entire supply of their resources, prefer as wide a coverage of their productivity-studies as possible, whereas the resource-user is mainly concerned with the studies of input-output relationships either at his own plant or in the other similar plants. The productivity-analyst may have, as such, to measure the relationships between the inputs and the relative outputs with different approaches in relation to the same production-line or function, as can be established by the following equations.

(i) $\frac{\text{Physical volume of the Output}}{\text{Man-hours (or machine-hours) worked.}}$ = Physical output per man-hour (or machine-hour) worked.

(ii) $\frac{\text{Physical volume of Productive Capacity}}{\text{Fixed Investments.}}$ = Productive capacity (in physical terms) per unit of the fixed investments.

(iii) $\frac{\text{Physical volume of Output}}{\text{Fixed Investments}}$ = Physical production per unit of the fixed investments.

(iv) $\frac{\text{Physical volume of Output}}{\text{Physical Productive Capacity.}}$ = Rate of utilisation of the Productive Capacity.

(v) $\frac{\text{Fixed Investments}}{\text{Man-hours (or machine-hours) worked.}}$ = Fixed investment per man-hour (or machine-hour) worked.

(vi) $\frac{\text{Horsepower consumed}}{\text{Man-hours (or machine-hours) worked}}$ = 'Power' consumed per man-hour (or machine-hour) worked.

(vii) $\frac{\text{Fixed Investments utilised}}{\text{Fixed Investments made}}$ = Rate of utilisation of the fixed investments.

(viii) $\frac{\text{Physical volume of Output}}{\text{Value of Materials consumed.}}$ = Physical production per unit of the materials-cost.

(ix) $\frac{\text{Value of Output}}{\text{Value of Materials consumed}}$ = Value of the output per unit of the materials-cost.

(x) $\frac{\text{Physical volume of Output}}{\text{Horsepower consumed}}$ = Physical output per H.P. consumed.

(xi) $\frac{\text{Physical volume of Materials consumed}}{\text{Man-hours (or machine-hours) worked.}}$ = Physical volume of the materials consumed per man-hour (or machine-hour) worked.

(xii) $\frac{\text{Value or Cost of Materials consumed}}{\text{Man-hours (or machine-hours) worked.}}$ = Value or Cost of the materials consumed per man-hour (or machine-hour) worked.

(xiii) $\frac{\text{Physical volume of some single Material consumed}}{\text{Fixed Investments}}$ = Consumption of the material (in physical terms) per unit of the fixed investments.

(xiv) $\frac{\text{Value or Cost of Materials consumed}}{\text{Fixed Investments made}}$ = Value or Cost of the materials consumed per unit of the fixed investments made.

(xv) $\frac{\text{Wage-costs}}{\text{Physical Output}}$ = Wage-costs per unit of the physical output.

(xvi) $\frac{\text{Material-cost}}{\text{Single Output (in physical terms)}}$ = Materials cost per physical unit of the output.

(xvii) $\frac{\text{Charges on the Fixed Investments}}{\text{Single Output in physical terms}}$ = Charges on the fixed capital per physical unit of the output.

(xviii) $\frac{\text{Wage-cost}}{\text{Materials-cost.}}$ = Proportion of the wage-cost to the materials-cost

(xix) $\frac{\text{Wage-cost}}{\text{Fixed Investment charges}}$ = Proportion of the wage-cost to the fixed investment charges.

(xx) $\frac{\text{Materials-cost}}{\text{Fixed Investment charges.}}$ = Proportion of the materials-cost to the fixed investment charges.

(xxi) $\frac{\text{Physical Output}}{\text{Total Investments}}$ = Physical Output per unit of the total investments.

(xxii) $\frac{\text{Total Profits earned}}{\text{Total Investments}}$ = Rate of profit per unit of the relative output X ratio of the total output concerned to the total Investments.

= Profit per unit of investment*

Problems pertaining to (1) definitions of inputs and outputs, and (2) analyis of the available productivity-data, no doubt, crop up, and they can be overcome to a large extent through the 'sub-products'[8] technique of data-collection. There are measurement-difficulties also because the available basic production-

* (Profit per unit of output can be calculated by finding out the difference between average gross receipts per unit of the output and average total costs per unit of the same. Calculations for equity investments or any other investments can also be made in the manner indicated above).

Notes: (*a*) The trends and measures of productivity can be ascertained also by reversing the positions of numerator and denominator in the first parts of the equations noted above:

(*b*) As the proportions of factor-combinations generally keep on varying over time and, as such, yield varying production results both in respects of the quality and quantity of the outputs, it is evident that no single output-input ratio can measure accurately the overall productivity over time.

(*c*) There are also cases, and they are possibly very many where a number of measures may have to be used in order to measure and focus upon a given productivity say, of labour of a given plant in relation to the productivity of its capital.

8. A 'sub-product' is a well-defined and more or less homogeneous component of a long cycle of given production-process or job. Thus, the typical gross end-product of a firm's entire activity would be equal to the total of its sequential sub-products, *i.e.*, all the work done would be accounted for and measured during a given period regardless of the completion or otherwise of the gross product.

data often suffer from discontinuous and incomplete reportage, say, on introduction of the new products, discarding of the old ones, revised definitions of product-classes, and quantities (or qualities) of individual products, in particular; and they have to be resolved in order to ensure comparability of the output-data over time. In fact, there would have been no measurement-difficulties, had the conditions of demand and supply of both the inputs and the outputs (and, for that matter, the trends of the relative production costs and revenues) been fairly uniform over time. The overall productivity can be, however, measured meaningfully by finding out the ratio of the goods or services produced to the relative total costs incurred, both the products and the costs being evaluated by a selected scale of constant prices with a view to eliminating the influence of the price-variations.

LABOUR INPUTS

It has been already referred to that because of the comparatively greater homogeneity of 'man-hours' as input, as also because of the most important significance of the visible labour among the inputs, that productivity is frequently and popularly expressed as 'output per man-hour', or as man-hours per unit of output (that is, the ratio of the total man-hours, required for the production of a given volume of a homogeneous good, to the given volume of that good). 'Man-hours' required per unit of output would, no doubt, reflect upon the relative labour-effort more clearly than the parallel 'output per man-hour' figures. A joint physical measurement, even if one is statistically and satisfactorily devised of all the inputs of diverse forms and characters in relation to given outputs cannot prove to be so meaningful as the measurement of the ratios of output to labour (the dispenser of all other inputs), for, there are associated comparatively more non-productivity factors with the 'non-visible labour' inputs than with the visible labour-input. But, on the other hand, a precise index of the overall industrial efficiency for the economy as a whole can be worked out by measuring and correlating (say, through 'weightage') the productivities of all the inputs, and not only of the visible labour.

A clear measurement of labour-productivity cannot be, however, made, so long as distinction is not established between such characteristics of the relative co-operant inputs and outputs, that influence the labour-productivity per man-hour (not per man-day), and those that do not. It will, therefore, be better if a given production-cycle is divided into a certain number of distinct homogenous stages so as to permit measurement of the productivity-levels at every stage by reference to a 'unit' fully representative of that stage.

CAPITAL INPUTS

In order to measure the productivity of a capital input, the productive capacity of which in fully utilised during a given time, the concept of 'net value added' per unit of the relative invested capital would seem to be preferable to the one of 'sales value' per unit (of the same invested capital), for, the 'sales value' generally varies, and is affected even by non-production factors, comparatively more than the 'net value added' does. It is the productive capacity of a capital-input that determines primarily the latter's contribution, i.e. productivity. It should, however, be noted that the capital-facilities do not possess, like the labour-input, any practicable degree of homogeneity, and this makes measurement of their productivity comparatively more difficult. Moreover, the investment suppliers, who are generally concerned with maximisation of the yield on their investments, are interested in the allocation and utilisation (generally in financial terms) of their resources among the capital-users.

The latter, i.e., the producers also estimate (generally in financial terms) both their capital-requirements per unit of the relative output as well as the effects, on their total capital-needs, of prospective adjustments in their output.

MATERIAL INPUTS

Even though the materials-inputs (being products generally purchased from other industries, i.e. the inputs which are not the internally-processed parts or intermediate products at the plant or in the industry whose productivity is studied) are, in effect, covered by the relative capital-inputs, they are separately expressed and measured (financially or physically) in order to determine the economy or wastefulness in the materials-consumption and thus import meaningfulness and precision in the production-cum-productivity analyses and adjustments.

MANAGEMENT INPUT

Management has, in brief, to ensure coordination of resource-application and improvement in the worth of the products. Its contribution is, therefore, not specific and, as such, measurement of its productivity is rendered difficult. It has generally two components, namely, (1) the personnel responsible for direction of policies and concerned with essentially strategic and creative tasks; and (2) the personnel entrusted with supervision of the production processes and maintenance of the records. (Supervision is undertaken by two distinct categories of personnel, namely, administrative and technical). The productivity of this input can be, however, measured comparatively more meaningfully by determining the differential effects of the changes in its personnel or policies on specified input-output relationships. That is, the measurement of this productivity would be rendered facile when a change or adjustment in the management's policies or practices can be considered as the sole major influence to which particular input-output adjustments can be attributed.

ENTREPRENEURIAL INPUTS

Measurement of entrepreneurial performance presents greater statistical problems than that of the capital or labour, primarily because the entrepreneurial tasks have not been broken up so far into any meaningful components. Such changes in the input-output relationships, however, as are brought about solely by entrepreneurial initiative will indeed form a good basis for measurement of the entrepreneurial productivity.

TECHNOLOGY

Since a technological advance is, in effect, a creative capital-ingredient in so far as it enhances the effectiveness of the accompanying ordinary or technologically inert resources embodied in the physical structure of the capital goods concerned, it is generally measured in terms of the resultant real economies made in the consumption of the resources employed for the relative output during a specified period.

PRODUCTIVITY-INDICES

In the light of the above-noted considerations we may now examine the construction of productivity-indices that serve indeed as highly meaningful indicators of industrial advancement and change. The construction of indices would have been easy if the factor-consumptions were more or less proportionate to the product-prices, for the quotient resulting after division of the traditional production-index by the consumption-index of the factor concerned can be, with justification, used as an index of productivity. But, since the contributions made by the associated inputs are neither indicative of any causal relationships among them, nor determinable in absolute terms, the quotient of any production-index and, say, the relative labour-input index need

not be an internal average of the productivity-relatives. It is, therefore, because of the heterogeneity of the outputs and the inputs and the consequent absence of any common unit for their measurements that "weighting' becomes necessary to remove the influences of the non-homogenous factors from the data studied and compared. 'Weighting' does minimise the margin of error and makes interpretation of the weighted data comparatively more meaningful than those without 'weights'.

Construction of productivity-indices with a view to reliably measuring the temporal, spatial and cross-sectional changes in the productivity-levels would be, however, satisfactorily possible only after resolution of the following difficulties. (a) *Aggregation of non-homogeneous data relating to the inputs and the relative outputs*: The production inputs are diverse; and, as such, man-hours, kilowatt hours, tons of materials, services of management, risk-bearing of the entrepreneur, and invested capital cannot be directly added and classified into meaningful resource-totals. The outputs of many major industries (such as, chemicals, engineering, electric goods, automobiles, glass, ceramics, etc.) are also markedly heterogenous. Difficulty is, therefore, obviously experienced in physically summating or aggregating the volumes of such inputs and outputs into meaningful totals. (b) *Homogeneous coverage of the data compared*: It is, for example, possible that one of the two units compared specialises in the manufacture of a commodity that is only insignificantly produced by the other. Besides, there may be marked differences in their degrees of process-integration. That is, the output-input ratio may reflect not the difference in productivity but only that in the degree of integration. Further, the output is generally referred to in terms of volumes of the finished products and the productivity-data do not generally take into account the 'work-in-progress' which may, however, account for employment of the input factors as much as the end-products do. Out of two compared units one may have a much larger volume of work-in-progress than the other; and if one determines and compares their productivity-levels only in terms of their finished outputs, the finding would certainly not be conclusive. This comparison-irregularity rather tends to be a marked one during the short-period analyses, for in the long-run the divergence between the finished products and the relative 'work-in-progress' gets largely narrowed down. It is, therefore, in terms of the work accomplished, and not in those of the products completed, that the outputs of compared units should be measured and the relative indices constructed. (c) *'Weighting' of production-complexes, particularly in regard to temporal and spatial productivity-comparisons*: The same product might undergo over two different periods such a sizeable qualitative change as to defy its comparison between the two periods. Such quality-differences may be narrowed down by giving proper 'weights' to the products, though the 'weights' cannot very precisely cover the constant dynamic changes. The diffculties involved are obviously much greater in case of the industries whose product-structures are complicated enough (unlike cement, sugar, and gold-mining industries, etc.) and undergo rather a number of marked visible and invisible changes. (d) *Meaningful analysis and interpretation of the observed data*: The interpreter must not forget the background against which the productivity concerned is measured, as also the fact that the necessary measurements are chosen and made mostly in conformity with the objects of the productivity-study concerned. (e) *Elaboration of all the variations, the statistical pitfalls, and the qualifying conditions*: Such elaboration will enhance the reliability of data- interpretation.

In spite of the above-noted difficulties the input-output analysis provides us with a fair insight into our industrial structures and costs; and it has, as such, to be adequately made and constantly tested. Since the changes in the productivity-levels take their roots generally in variations in productivity-determinants, it is indeed very necessary to analyse also as to how such determinants act and react upon each other and result consequently in the inter-unit, inter-industrial, and international differences in productivity.

PRODUCTIVITY-STUDIES AND COMPARISONS

As the efforts made by the suppliers and users of both the inputs and the outputs are all interdependent and interacting, productivity-studies at any one level—job, plant, firm, industry, sector, or the national economy—necessitate both the micro-scopic and macroscopic analyses—factual, functional, financial and physical—so as to make such studies sufficiently conclusive. It is, however, possible that in particular cases one type of analysis may need to be made more thoroughly than the other, and it will depend upon the relative needs and circumstances. Moreover, the immediate purpose of productivity-comparison (inter-temporal, inter-sectoral and inter-spatial) is to pinpoint such positions, processes, phases, and components of the production-line concerned, as stand in need of change with a view to maximizing favourable gaps between the relative benefits and the parallel burdens.

So far as the international productivity-comparisons are concerned, they are made to determine either the differences in particular productivities occurring at particular times or those in the rates of the overall national productivity-developments. The relationship between given overall productivities of compared countries, however, depends upon the price structure used as reference for the comparison, for one price-system may prove to be more (or less) advantageous than the other in favourably determining the productivity of one of such countries. The international differences in the distribution-pattern of the production factors, particularly of labour and capital, are indeed a material variable, for they determine the relative labour-costs and contributions. In order to make deeper probes into the domestic industrial structure in comparison to the other national economies and to ascertain the effects of productivity-changes on the levels of employment, the need to make comparisons in terms of the various types of productivity is obvious. Moreover, the limitations and advantages of such comparative studies both need to be stressed from the viewpoints of the various economic or industrial interests.

Productivity studies, if scientifically pursued, will indeed give valid answers to the following questions which are of paramount social interest: A. Is the rate of domestic industrial efficiency, i.e. of the national economic progress, fast enough and satisfactory in comparison to the other economies? B. Are the rises in the rewards of the production-factors resulting also in parallel productivity-rises? If so, at what sources and rates, and if not, why? C. How and to what extent are the various interests of the national economy benefitting from the productivity-gains being made?

The input-output studies are made mainly to find out which combination of resources at given task-assignments of the production-line concerned would yield the best possible results. The broad purposes of productivity-study may be stated as follows: (a) To measure and compare, periodically, the productivities of specified inputs in order to test whether the latter are being rationally employed or not. (b) To make adjustments between the production and the prices of both the factors

and the outputs in accordance with the productivity-trends, i.e. to make adjustments in the composition, quantity, and quality of both the inputs and the outputs so as to ensure maximum possible overall productivity. (c) The processes of production may be either labour-dominated or machine-dominated. Without productivity-analysis the necessary adjustments, that may be called for between the doses of labour and capital, may not be made and this may tend to create an imbalance in the economy concerned. (d) To determine where, to what extent, at what cost, how, with what speed, when, and why the given innovations may be made. (e) To scrutinise the claims of the production-factors over the productivity-gains made and thus to formulate productivity-stimulating policies with regard to labour and enterprise.

PRODUCTIVITY-GAINS

Wherever progressive managements have organized productivity-drives based upon a detailed purposive analysis of 'jobs', the result has been better earnings, happier industrial relations, easier and more effective work; and marked savings in time, materials, fuel and power have certainly been reported. To secure substantial output gains, however, it is necessary to study, inquisitively enough, not only the tasks assigned to the individual employees or machines, but also those assigned to the entire departments or plants or firms so as to determine both (1) the most economic combination, as well as (2) the changes in the productivities of the inputs at every operative level. This necessitates task-centred measurements of input-output relationships.

CONCLUSION

The concept of productivity, it is evident, is not a unitary variable but one which views production as a network of interactions among several specified inputs — direct and indirect both — and also among the inputs and the relative outputs. Adjustments in the contributions of a given input are caused generally by the changes in the average quality of such input, in the effectiveness with which tasks are designed to harness the potentials of this input, in the level of idleness of this input during working hours, and in the combination of higher and|or lower productivity-tasks assigned to the input. The productivity-adjustments are obviously not uni-dimensional, for they are the result of interactions between the productivities and combination-proportions of labour, capital, and materials. The changes in overall productivity may, therefore, first originate either in the productivity or in the combination-proportion, or in both, of any input factor or factors and may then affect the productivities and combination-proportions of the other input-factors.

Since the production-adjustments are made in accordance with the market pressures, productivity - achievements are generally made, and can be retained, only when the relative market is kept stable and expanding. That is, the conditions, that govern the growth of the market, are the main determinants of the productivity-levels in the market concerned. In the ultimate analysis, however, *it is the quality of labour that is the most decisive component not only of labour-productivity but also of the overall national productivity,* for the labour-input finally disposes of, and is the motivating force behind the potentialities of all other inputs; and, as such, *changes in the quality of labour bring about rather marked changes in productivity-levels.*

The overall industrial productivity can be improved, in brief, by ensuring an integrated fulfilment of the following pre-requisites : a. A broad-based industrial planning, making due provision for adequate transport, power, communication, and credit facilities, so as to enable the industries to maximise their

internal as well as external economies. b. Regularity in supply, quality production, and abundance of the materials-inputs, to be ensured, as far as possible, from the domestic sources. c. A trained and contented work-force in whose welfare the managements should be sincerely and throughout interested. d. Efficiency and adequacy of the production-aids including machinery, know-how, and industrial research. e. Cost-conscious, plan-minded, and well-equipped managements prepared to adopt productivity-techniques. f. A productivity-stand in the policies of the state with a view to providing full measures of incentives to the producers, the workers and the consumers and thereby ensuring rational wage-cost-profit-price structures. g. Sound monetary management and fiscal policies so as to speed up the rates and volumes of savings, capital-formation, and industrial investments. h. Measures to expand both the domestic and foreign markets, through market-research and otherwise, via establishment of an adequate statistical machinery to check up the achievements made, and plan for those desired, by amassing sufficient guidance for decision-making. j. Setting up of the institutions to guide the plants, industries, and firms in chalking out their productivity-schemes.

There are, however, two crucial factors, which will determine the success or otherwise of productivity-drive in India, namely, (a) the emergence of a productivity-minded labour-leadership, and (b) modernisation of industrial techniques, via systematic research, in association with use of adequate motive power, (ii) scientific layout of the plants and (iii) labour-activising mechanical-aids, of course, within the limits imposed by the current human-employment potentials.

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Work Study

R M Currie

Where Work Study is applied, practical gains in lower capital needs, in improved production, reduced costs and higher quality of output are the rule. But while Britain does not lag behind in its knowledge of Work Study, the speed of application is far too slow.

IT is often said that Britain's greatest resource is brains. This is as true in the field of Work Study as elsewhere, and our colleagues in other countries willingly agree that the Work Study techniques developed and available in Britain are second to none. But what we have still to do is to learn how to apply Work Study with the speed and intensity of the Americans, for example. In Work Study, as in other fields, there is little excuse for this country to lag behind in the race to extract the utmost in the form of goods and services from our resources—not only in brain power but materials and capital equipment as well.

If we study the international productivity indices, we find that according to recently issued ILO figures our improvement during 1957 was only 1.7 per cent, against Japan's 6 per cent. True, labour productivity indices do not tell the whole story: they do not disclose the proportionate effects of new capital investment, process and product research, and so on. Again, our record may have been affected by government policies against inflation. But Work Study can make immediate contribution to higher productivity; and by helping to cut costs all round it works against inflation.

Let me quote an instance of all-round improvements that resulted from Work Study application to traditional methods of colour-mixing and matching in the manufacture of leathercloth. By the old method, the required colours for spreading on the fabric as it passed through the calenders—a form of rolling mill—were produced by the colour-strikers on the basis of past experience. Colour-mixing formulae were based on the customary traditional 'hit and miss' methods; hence, no accurate measurement of work was possible, and no proper incentive scheme could be arranged. With the assistance of Work Study, not only were precise technical formulae established for colour-striking, but reliable Work Measurement values were determined so that an individual incentive scheme could be introduced. The results can be summed up in terms of facts and figures as follows:—

Manpower changes	Nil
Batch increase	4 to 8
Reduction in labour cost	55 per cent
Cost of Work Study	£205
Saving (per annum)	£2,300

Convincing examples of this kind are coming forward now from widely diverse sources. The tradition is becoming well established of practical co-operation between Work Study specialists and the other members of the management team. The latest development of this co-operation has enabled the power of Work Study to exert real influence at the first conception of new plant design. It is now possible, for

* The author is the President of the British Work Study Society. Some time ago, he visited India and gave talks on Work Study at Bombay, Delhi and Calcutta. He has recently published an authoritative book on Work Study which is almost of a classical standard.

example, to forecast more accurately than before the number of men required to operate a plant before production starts, which has the double advantage of making sure that the actual jobs to be done are within the capacity of the men to be employed, and avoiding future redundancy by manning the plant at the proper level in the first place. The figures in the table cover five typical production plants and demonstrate first the discrepancy between traditional and Work Study estimates of manpower requirements, and, secondly, the effect of combined work, on these estimates when the Work Study department is brought in as a member of the team.

MANPOWER ESTIMATES

Total Number Required to Operate

Plant No.	Using Traditional Methods	Forecast Using Work Study	Actual
1	27	13	14
2	66	13	12
3	65	43	43
	Combined Assessment by Techincal Staff and Work Study Department		
4	48		44
5	12		12

I have only space for one more typical Work Study result covering the loading of bulk crystalline material into ships. The organized critical examination of the study suggested that the use of open goods wagons was wasteful in money and manpower, and that it did not result in the loading speed and cleanliness required. The new methods replaced the wagons by lorries and a steel skip was designed which could be lifted by twin hoists on the transporter crane on the ship's hold, tipped and then replaced on the lorry.

Detailed Work Study using this prototype skip demonstrated the best methods of loading and discharging, the proper manning strength, and the most suitable type of lorry. Using railway wagons, eight men had been employed on filling at the works and on emptying the product into the ships; using the new methods which included a Work Measured incentive scheme—these teams were reduced to two and three men, respectively. A rate of 800 tons per shift was aimed at, but with two skip lorries available and no delays, rates of 1,200 tons have been achieved. The ships are loaded more quickly; there is appreciable saving on railway freight charges and demurrage charges on wagons have been eliminated; contamination of the product loading no longer occurs, locomotive power has been saved; no time is lost by the road vehicle drivers; and the ships are loaded with greater accuracy as to weight. The total savings are in the region of £15,000 per year. The scheme has now been in operation for over four years and a half; a million tons have been handled in 70,000 skip-loads. There have been no driving accidents!

The examples given above underline the point that the present-day view of Work Study does not solely aim at the more effective use of manpower at shop-floor level. Against this view, we should set the opinion expressed by a distinguished industrialist in answer to a correspondent: 'It would seem...that you are under the impression that Work Study is primarily concerned with the operative, and more particularly with financial incentives for him. Whatever thinking may have been in the past, we have found the impact of Work Study travelling steadily away from the shop floor to the board room. We now regard it as symbolizing the analytical and progressive attitude of mind which is mainly concerned with making management manage better, rather than getting the workman to work harder.'

It is not possible to give national statistics indicating the increase in Work Study activity and effectiveness in recent years. The best way in which I can give an idea of the progress Work Study is making in Great Britain is to mention some recent developments which will be recognized by readers as significant:

1. The call for Work Study is ever increasing, and training facilities are constantly being extended to keep pace with the present demand for competent, properly trained personnel, who are in tragically short supply.

2. Several employers' organizations are providing a Work Study service to their members. Noteworthy, in view of the high proportion of British firms employing less than a hundred people, is the advisory service for small firms set up by the National Union of Manufacturers.

3. The intensity of Work Study training among the more progressive elements in the trade union movement, and the signing of national agreements between employers and trade unions on Work Study.

4 The incorporation of Work Study as an examination subject in the syllabuses of professional institutions of the highest repute; a recognition of the importance attached in many industries to Work Study as a vital ingredient in the training and development of candidates for higher management.

5. The splendid effort of the British Productivity Council in propagating the Work Study approach.

6. The widespread successful application of the techniques outside industry —to the Armed Forces, agriculture, the hospitals, to name but a few fields— which has helped to convince the waverers that still remain within industry.

However, there are still obstacles in the way of further progress. We can, we are told—and every Work Study man believes it—double our standard of living within 25 years. The price to be paid for this is that British management should abandon their veneration for production and control methods sanctified only by their antiquity. As the Duke of Edinburgh puts it: 'If anyone tells you that there is not a better way of doing something, he is either a supernatural being or a supernatural clot.'

* * *

HISTORICAL CHANGES IN PRODUCTIVITY

How many hours of work are required to buy undermentioned goods ?

FRANCE : Unit (Time)

(a) Things in which productivity increases have been substantial.

	Beginning 18th Century	End 19th Century	Mid 20th Century
Mirror glass (four centiare)	40,000	800	250
Bicycle	—	1,500	200

(b) Things, whose productivity has not materially changed:

Handwoven brocade (one centiare)	2,600	2,400	2,300
Shaving at barber's	3|2	5|3	1

The NPC

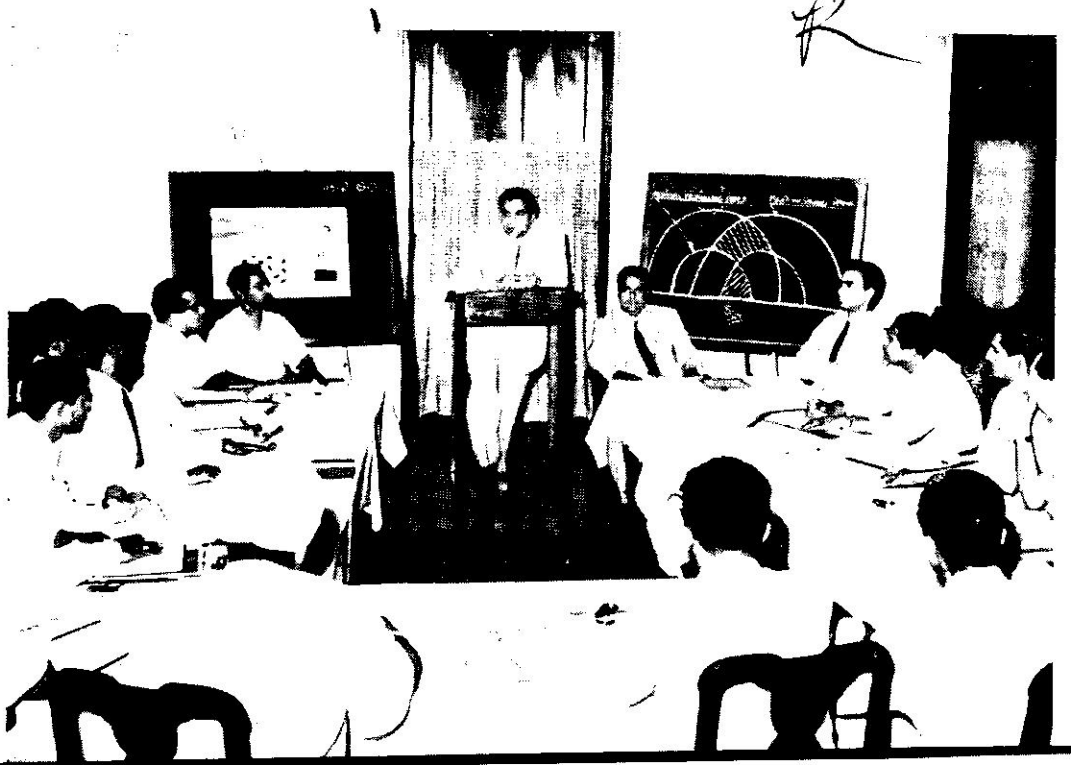
WITH a view to accelerating the pace of productivity drive in the country, a conference of all Local Productivity Councils was convened by NPC in February last. 47 representatives of 30 LPCs attended the conference. Dr. P S Lokanathan, Chairman of the Governing Body of National Productivity Council, presided. Sri Manubhai Shah, President of the Council, inaugurated the Conference. The Executive Director presented a survey of the activities, generated by the NPC and the LPCs. 34 LPCs have so far been established. 117 talks and 40 seminars, conferences etc. have been organised with the participation of 7730 persons. 50 training courses have been organised in various subjects of industrial productivity. 962 persons have so far participated in these training courses. 309 shows of productivity films have been organised at various places in the country in which the audiences aggregated to nearly 20,000 persons. All these activities have been generated by the staff of NPC.

Dr. P S Lokanathan in his speech emphasised the need of co-ordination and close relationship between the NPC, Regional Directorates and the LPCs. He made the following important points: (i) It would be beneficial if some LPCs were to join together to undertake common programmes. (ii) We need to ensure high quality of our various training programmes. (iii) There is need of greater financial assistance to LPCs for enabling them to expand their activities. (iv) With the establishment of 34 LPCs it would be advisable to revise the constitution of NPC for securing greater representation of LPCs on it.

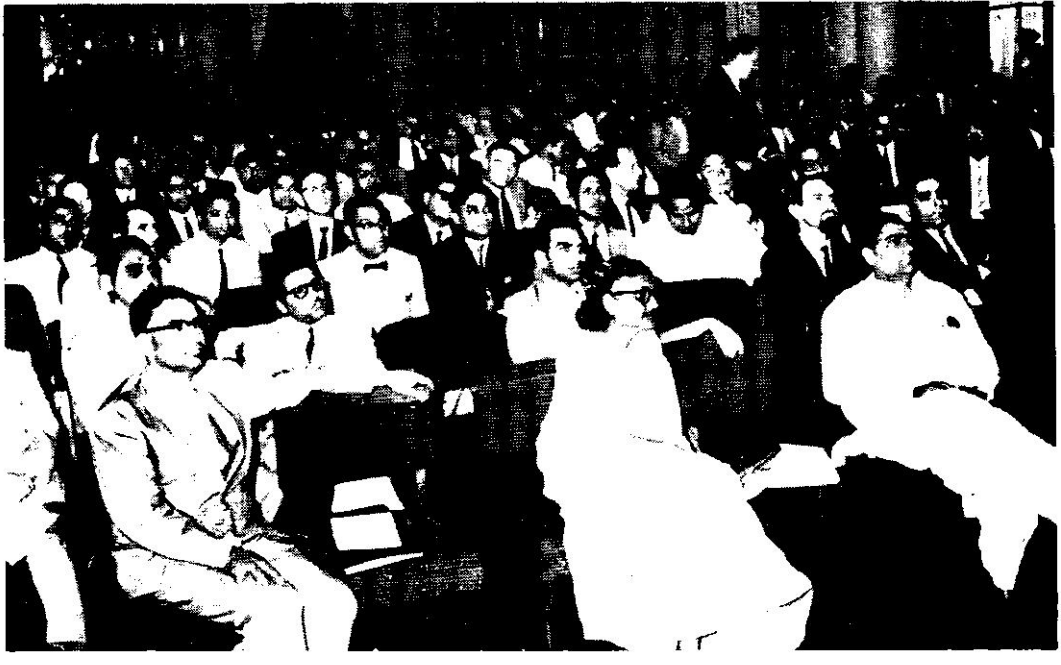
Sri Manubhai Shah also spoke in favour of strengthening the LPCs since they were the bedrock of the Productivity Movement. He made the following important suggestions: (i) An all-out effort should be made to secure very capable instructors to be placed at the disposal of regional directorates and the LPCs. (ii) Training in the subjects of industrial productivity should be initiated in technical institutions. For this purpose it would be desirable to set up a Board of Studies, registered as a society, to co-ordinate and initiate the training programmes. (iii) It is necessary to expand the regional directorates of NPC. It might soon become necessary to establish regional directorates of NPC in every State. Originally the Small Industries Service Institutes had been established only at a few places but they had then to be expanded for providing services to all the States. Personnel in the existing regional directorates of NPC is small and requires to be further strengthened. (iv) In regard to the finances for the productivity movement, it would be premature to consider that the LPCs could become self-supporting in the near future. A Grant-in-Aid Code may be established for giving them financial assistance for the various programmes. The Code should provide for matching contributions on the existing basis, supplemented by 100% grant for enabling LPCs to engage industrial engineers and also additional grants for undertaking specific activities and programmes such as publishing journals, stimulating in-country teams etc.

The conference accepted the policy suggestions of the President and the

NPC Work Study Course in Progress at Calcutta



Dr. B C Roy, Chief Minister, West Bengal, inaugurating the Productivity Conference on NPC's First Foreign Team Report. Section of the audience shown below.



Chairman of NPC. The other points that emerged from the discussions at the conference may be briefly mentioned: (i) Considerable momentum has been generated for rousing productivity consciousness. *'Preachment'* phase has by and large been crossed and we have reached the *'Teachment'* phase. In laying stress on the quality of the training programmes it would be necessary to set up an institution for training industrial engineers. (ii) A comprehensive training programme should be organised to meet the requirements of all levels of management and technicians in various important subjects, keeping in view particularly the training requirements at the workers' level. (iii) The personnel of NPC and LPCs should participate in the activities of workers' Education Centres for dissemination of productivity knowledge to the working class. (iv) NPC should continue to disseminate more material to LPCs for being utilised by them for distribution to members. The LPCs would like to translate the material into local languages, wherever necessary. NPC should also produce material specifically for dissemination to the level of workers. (v) It was urged on behalf of LPCs that steps should be taken to persuade the public sector enterprises to join LPCs. (vi) Productivity films should be synchronised in Hindi for effective dissemination of techniques.

Following is a brief account of the recent activities of LPCs:

Amritsar: Three-day appreciation course on Work Study.

Andhra Pradesh: Three-day appreciation course on SQC techniques for top management; eight-week application course on work study; course on TWI in April-May.

Asansol: Talk on Human Relations and Productivity scheduled in March; and a course on Stores Reorganisation and Control, in April.

Baroda: Talks on Management in Underdeveloped Countries, and Basis to Build Organisational Structure of Industry, by Dr. Earnest Dale of Cornell University, USA; three-day course on Materials and Inventory Control in March. Future programme of the Council includes courses for industrial executives in Production Planning and Control and Management Accounting. The Council's in-country team on small scale industries visited Calcutta. The textile industry team visited mills at Madras, Madurai and Coimbatore.

Bombay: Course on Work Measurement; a talk on Work Study by Mr. Russell M. Currie, Head of the Central Work Study Department, ICI, London; seminar on Wage Incentives and Productivity, with participation of Mr. T. Thomas of Hindustan Lever Ltd., Mr. Eric Paterson and Mr. Meyer Bernstein of the US Small Industries Exhibition.

Calcutta: Conference on First Productivity Team Report, inaugurated by Dr. B C Roy, Chief Minister of West Bengal; a talk by Mr. Russell M Currie on "A review of modern work-study methods" at the Conference; nine-week course on Work Study; and a course on Industrial Safety currently being conducted by the Directorate of factories, West Bengal, in collaboration with Calcutta Productivity Council and NPC; seminar for supervisors on Introduction to Work-Study Course and Elements of Supervision; seminars for top and middle management on Introduction to Productivity, Work Study Technique, Production Planning and Control; Plant Layout and Materials Handling; another seminar for workers on Productivity and Elements of Work Study. The Council was scheduled to organise courses on Stores Reorganisation and Control in March; also a talk on the position of foreman in industry; a course on Materials Handling scheduled in May.

Coimbatore: Five-day course on Production Planning and Control. Three-week Junior Managers' Course being currently conducted at the time of writing. Programme of the Council includes courses on Safety and Methods Improvement (April-June).

Dalmianagar: Seminar on Personnel Management; courses on Stores Reorganisation and Control and Basic Supervision.

Delhi: Supervisory Training Course; an in-country team for Light Engineering Industry.

Faridabad: An in-country team on Work Study, Quality Control, Incentives.

Indore: The Council was inaugurated on 26 February by Sri Manubhai Shah and a Productivity Conference was held on the

occasion. A one-week appreciation course on Work Study for Top Management has been conducted. A circuit on Quality Control and Human Relations was scheduled to be organised by the Council in March.

Jamshedpur: Talks on 'Man and Organisation' and "Proposed Activities of the Local Productivity Council"; course on Work Study in April.

Kanpur: Course on Work Study; seminar on Labour Productivity for evolving a labour approach to productivity movement. The programme of the Council includes the formation of circuits on Quality Control, Work Study and Human Relations and a symposium on Work Study.

Kerala: Appreciation Course on Quality Control; subject-study Team on Safety and Welfare Measures, in process of formation.

Madras: Three-week Junior Managers' Course; course on Management Accounting; three circuits on (i) Employee Selection and Placement (ii) Safety Measures and (iii) Work Study. Courses scheduled during next four months on Quality Control, Work Study etc.

Madurai: Courses on Selection, Placement and Training and on Cost Control; Junior Managers' Course; and a course on Stores Reorganisation and Stock Control to be held in May.

Mysore District: Talk on 'Major Trends in Management' by Dr. Earnest Dale; courses on Management Accounting (conducted by Mr. J A Paterson), Work Study and Quality Control.

Mysore State: Course on TWI and Job Instruction, conducted by Mr. K D S Anderson, TWI Expert; talk on Industrial Enterprise—Its organisation and structure, by Prof R Natarajan of the Indian Institute of Science, Bangalore; course on Quality Control for trade union leaders; and a course on Cost & Budgetary Control.

Poona: Course on Methods Improvement for Small and Medium Industries to be held in June.

Rajkot: Nine-week Work Study Course commencing on 8 April.

Rohilkhand: Two in-country teams on Grievance Procedures and Stores and Inventory Control.

Salem: Course on Production Planning and Control; appreciation course on Work Study.

Surat: Course on Methods Study; Junior Managers' Course; circuits being sponsored for study of methods improvement; programme: follow-up of Method Study Course; seminar on Management of Small Industries to be conducted by Sri Y A Fazalbhoy, leader of the Management Education Team to US and Mr. Edwin H Schmitz of TCM

Tiruchirapalli: Appreciation Course on Work Study; programme: Course on Production Planning and Control.

Vidarbha: Course on Small Industries Business Management, conducted by Small Industries Service Institute; course on Methods Improvement for Small and Medium Industries scheduled for April-May.

In addition to the above programme organised by LPCs, a number of institutions and organisations have, as usual, undertaken similar activities in recent months.

Madras Region: The Institute of Management, Coimbatore, joined the South-India Mill-owners' Association and the Coimbatore Productivity Council in organising a Management Seminar, in which Dr. Earnest Dale participated. A lecture on Cost Control was given by an NPC Specialist under the auspices of South-India Chartered Accountants' Students Association.

The NPC specialists presented two papers—one on 'Cost & Productivity In A Controlled Economy' at the All-India Cost Conference held at Madras under the ægis of the Institute of Cost & Works Accountants, Calcutta; another on 'Incentive Schemes' at the annual conference of the Institute of Personnel Management, Bangalore. The Madras Conference, inaugurated by Sri C. Subrahmanyan, Finance Minister of Madras, had three sessions on (i) Cost Control and Cost Audit in the Public Sector; (ii) Trends in Industrial Accounting, and (iii) Cost and Productivity in a Controlled Economy.

Calcutta Region: The Indian Institute of Personnel Management organised a course on Conference Leadership. Talks on subjects like Plant Utilisation, and Materials Handling and Producti-

vity were delivered, the former under the auspices of the Work Study Association, and the latter under the auspices of the Institute of Engineers, Calcutta. The Small Industries Service Institute, Tinsukia, is scheduled to organise a five-week Training Course on Business Management.

Bombay Region: A seminar on Market Research and Sales Planning was organised by the Sales Executives' Association, Bombay. The Bombay Management Association organised two talks—one by Dr. Earnest Dale on How to Improve Organisation of Your Company and Your Job, and the other by Dr. John Perry Miller of Yale University, on The Role of Industry in Economic Development. The Ahmedabad Textile Research Association (ATIRA) held a three-day Management Conference in February. Among the subjects discussed at the Conference were (i) Problems of Consultation (ii) Communication and Consultation (iii) Role of Personalities and Standards in Organisation and Administration and (iv) Group Interpretation Method in Executive Development. Sri G D Birla inaugurated the Conference.

Bangalore Region: The Institute of Management, Bangalore, organised a five-day programme in February on Executive Development. The main speaker was Dr. Earnest Dale, and the subjects related to company organisation, wage structure, labour management cooperation and management control. Prof. Charles Orr, ILO Expert, led discussion on workers' participation in management. The 10th Annual Conference of the Institute of Personnel Management was inaugurated at Bangalore by Sri T. Subrahmanyam, Minister of Law and Labour, Mysore State, and presided over by Sri R Venkataraman, Labour Minister, Madras.

Kanpur Region (including Delhi) The Delhi Management Association recently organised a lecture on Management and Organisation by Dr. Earnest Dale. The Association was scheduled to organise a talk by Dr. Morris Budin, Economic Analyst of the TCM on Fruitful Exchanges of Ideas among Management Levels; and a seminar on Development of Some Management Practices, under the joint auspices of the Association and Indian Institute of Public Administration. Mr. Herbert A Simon of the Graduate School of Industrial Administration, Carnegie Institute of Technology, USA, was to lead the discussion at the Seminar. The five-month Course on Business Management, organised by the Small Industries Service Institute, Kanpur, is nearing completion.

The above account of various productivity and allied organisations shows the emergence of an intensive phase in the progress of the productivity movement. NPC has not been slow in taking advantage of the situation as it is developing. It is itself organising a seminar on Workers' Participation in the Productivity Drive. Many other important subjects will also be discussed at the Seminar: (i) Role of Trade Unions, Management and Government in Productivity Drive. (ii) Policy and Programme of NPC. (iii) Sharing the gains of productivity.

The tempo of NPC training activities has gathered some momentum in recent months. Among the important courses organised were: work study course at Calcutta and Kanpur, methods study course at Surat, appreciation course in work study at Amritsar and Tiruchirapalli, application course on work study at Hyderabad, junior managers' course at Madras and Coimbatore, industrial relations course at Mangalore, top management appreciation course at Indore and job relations course at Lucknow. As this is being written, NPC Training Committee is meeting to review the training programmes so far launched

and to consider the courses to be projected in the future.

In addition to the above training programmes, a number of seminars, conferences and symposia were organised throughout the country, in which the specialists of NPC participated. Among the important subjects covered at the seminars were market research, wage incentives and productivity for top management, supervisors and workers, workers' participation in management, management programmes, trade-unions' role in productivity etc.

Talks have been given by NPC Specialists at various centres on subjects like cost control, statistical quality control, work study, elements of supervision, planning and control, employee selection, wage administration, standardisation, human relations, safety, plant layout etc.

During February 1960, 13 establishments were visited by NPC specialists and offered Advisory Service on such problems as method improvement, method study, production planning and work study. Preliminary reports were submitted to the units concerned and follow-up action on these reports was taken in hand. The Advisory Service is increasingly being diverted to the follow-up of participants of training courses in their plants.

NPC has almost completed the preliminary steps in respect of sponsoring in-country productivity teams through LPCs. Some LPCs have already gone ahead in this field. Among the LPCs which formed in-country teams during February 1960 were Baroda, which sponsored a subject study team on small scale industries and a textile team. Madras has organised a team on industrial relations.

The formation of circuits has already been referred to. For reference purposes, however, circuits, formed in February 1960, may be briefly mentioned: 1. Method Study Appreciation (Surat Productivity Council). 2. (a) Selection, Recruitment and Training and (b) Safety Measures (Madras Productivity Council). 3. Materials Handling (Tiruchirapalli Productivity Council). 4. Safety & Welfare (Salem Productivity Council). More circuits are being arranged and their programme finalised by various LPCs. The Materials Handling Circuit sponsored earlier by the Baroda Productivity Council and the Welfare Circuit of the Mysore State Productivity Council have completed their programmes and are preparing their reports.

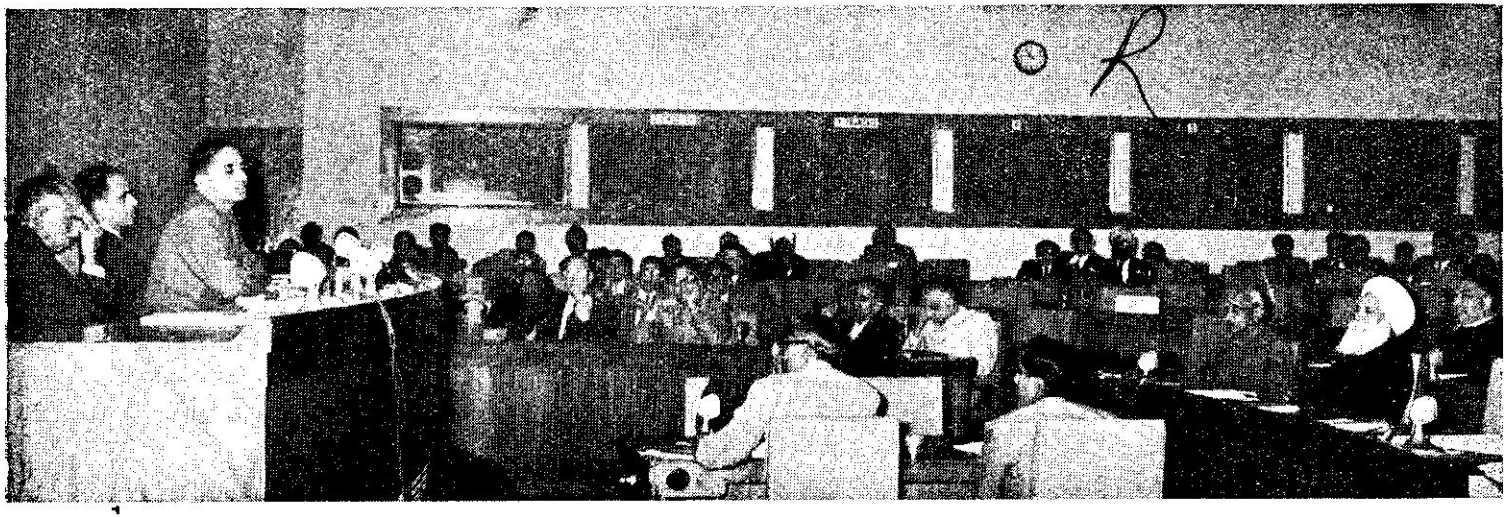
Audio-visual activities have their importance in the NPC programme. 171 films have been received so far under TCM aid. These films are being previewed and will be released in the near future for showing to industrial audiences. An exhibition on cost control was recently shown at Indore.

The above is a summary account of what the NPC has been doing in recent months. The future appears full of promise.

* * *

PRODUCTIVITY TECHNIQUE IN FISH BREEDING

China has found out a productivity technique in fish breeding. Finding that different species of fish thrive at different depths, they have experimented in utilising the same fish-pond for breeding three different species, one near the bottom, another at the middle and the third haunting the top layers. The result has been a many times increase in the yield of fish from the same fish pond. (Indra Sanghi)



All-India LPC Conference, Vigyan Bhavan, New Delhi

Inauguration of Jamshedpur Productivity Council

Utilization of Industrial Waste
A Study in Productivity

S M Das Gupta[1]

Opening the Coke Oven Plant at Durgapur on March 14, 1959, Rashtrapati Dr. Rajendra Prasad referred to "wastage in industries, big and small. Looking at the country's economic problem, one is struck by wastage all round. If this could be stopped, there would be tremendous progress."[2] In fact, there would be an infinite increase in productivity, if we were to heed Rashtrapati's advice, as we must.

THIS paper is concerned principally with the "profitable utilization of waste from manufactures".[3] Probably the case of molasses is historically the most significant in this connection. There was a time when sugar factories found the disposal of molasses an extremely burdensome problem. Now the conversion of molasses into power alcohol has meant a tremendous gain both to the sugar manufacturers as well as to the economy as a whole, being generally deficient in terms of mineral oils. This case should suffice to prove that there is probably nothing comparable, in terms of productivity, to the profitable utilization of waste from manufactures. A number of cases will be cited here to show how waste from various industrial manufactures can be turned into useful products, at a cost much less than it would be otherwise.

But for all this substantial gain in terms of productivity, a national effort is needed. We have become so used to waste that it has become a part of the national character. It has, therefore, been suggested here that a National Committee be established for the prevention and profitable utilization of wastes from manufactures.

The author has experience of a number of chemical factories, particularly chemical process industries, which are faced with great difficulties in respect of their basic raw materials; yet it may be possible to keep them fairly well supplied from a wide variety of wastes that occur normally and on a fairly large scale in a number of industrial processes. In any case, avoidance of waste in the use of raw materials, and otherwise, generally, would be profitable to these concerns.

The profitable utilization of waste material, however, is a technique by itself. Modern techniques are required to recover useful materials from waste and to transform them into valuable chemicals and other products. When so processed, the factories would find that their industrial wastes are, in fact, more valuable than the raw materials, of which they are only the by-products.

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1. Dr. S M Das Gupta is Regional Liaison Officer, Council of Scientific and Industrial Research, Calcutta.
2. See PRODUCTIVITY (back of contents page) Vol. 1, No. 3, February-March, 1960.
3. Reference: Choudhury, Dr. J K: "The Utilization and Disposal of Industrial Wastes. The need for a National Programme." Presidential address (Section of Chemistry), 37th Indian Science Congress (1950).

There was a time when any material product that a manufacturer did not want was just turned loose into the air, such as carbon-dioxide, chlorine gas etc.; or drained into the nearest stream or dumped somewhere without any regard for odour or toxicity. Now, of course, it is more difficult than it used to be and manufacturers have to take care in the disposal of waste products. Further, technologists have come into the picture, showing promising interest in the profitable utilization of factory wastes.

In fact, in industrial parlance, the term 'waste' is becoming a misnomer. All waste products have in them the possibility of being turned into something marketable, either to consumers or to other industries. In such a scarcity economy as ours, this conservation and conversion of waste material, apart from the needs of public hygiene, are of the utmost importance.

There is another important point in a dynamic economy. With industrial production increasing at a faster pace, the quantum and variety of waste material would be increasing at least in proportion, if not more, as is generally the case in waste products. Since the inception of planning (1951), the volume of industrial output has gone up more than 50%, and in certain lines it has increased several-fold. We have nearly increased our steel capacity five times and may in turn double or treble it during the Third Plan period. The chemical industries, because they started from scratch, have increased their output to an extent which is statistically phenomenal. Many new lines have come up, of which we have not much experience with the result that the possibilities of waste are greater than normal. The increase in factory waste, consequent upon this large industrial expansion, is bound to become a problem, both to the municipal authorities as well as to factory managements. Hence the immediate need of a National Committee to which a reference has already been made. The following table shows that substantial waste already occurs in many lines.

GENERAL LIST OF INDUSTRIAL WASTES IN INDIA

1. Corroded iron and steel.[4]
2. Waste sulphur and sulphur dioxide from coal and natural gases.
3. Sisal, jute and wool wastes, rice-straw, sabai-grass, millrun cotton linters etc.
4. Foundry slag.
5. Wood waste, such as saw dust etc.
6. Sulphite waste liquor from paper factories.
7. Waste skins and fleshings.
8. Titanium dioxide (pigment) and titanium tetrachloride from bauxite sludge (red mud) from aluminium factories.
9. Bagasse from cane sugar factories.
10. Waste solvents from paint factories.
11. Fusel oil from refineries.
12. Coal waste (powder and shale) from coal mines.
13. Discarded rubber products and rubber scraps from rubber factories.
14. Sulphurated hydrogen in commercial gases like synthesis gas.
15. Effluent from cinchona factories.
16. Manganese dioxide (hydrated) from pharmaceutical factories.
17. Sinews from bone crushings in bone mills.
18. Pickle liquor from chemical manufactures, bucket manufacture etc.
19. Mica waste from mica mines etc.
20. Natural sillimanite waste.
21. Dairy wastes.
22. Iron ore fines from mines.
23. Leather waste from tanneries.
24. Nickel catalyst waste (spent catalyst black) from hydrogenation oil factories.
25. Residual ash from burning of sulphur in the manufacture of high purity sulphuric acid etc.[5]
26. Zinc waste in zinc ores.

4. It has been estimated that India loses, in this way, iron and steel worth Rs. 50 crores annually.

5. Selenium may be recovered.

The list printed above may appear substantial but it is really only illustrative. At present only a small fraction of these factory wastes are being utilized, major quantity being thrown away haphazardly without ascertaining whether it could be converted into useful products. Here the chemical engineer has an important function to perform: (a) to prevent the formation of waste during manufacture by control of unit operations and processes and (b) to work out processes by which the inevitable waste could be turned into marketable products. A few case studies may be cited here.

I. WASTE PROBLEM OF MANGANESE DIOXIDE (HYDRATED) RECOVERED AS A BYE-PRODUCT IN THE PHARMACEUTICAL INDUSTRY

It is estimated that approximately fifty tons of this waste are annually dumped or thrown away by pharmaceutical manufacturers, but this can be profitably utilized in the manufacture of: a. depolariser in primary batteries; b. manganese sulphtate from ferrous sulphate leaching or by digestion with saw dust and sulphuric acid; c. potassium permanganate and d. manganese linoleate as a drier in paint industry. Of these, the manufacture of potassium permanganate (K Mn O4) has a great possibility in India, and will be dealt with in some detail. At present there is no manufacture of potassium permanganate in India. We have been importing on the average in recent years about 8000 cwt of potassium permanganate, valued annually at about one million rupees. A typical analysis of the waste product of manganese dioxide (hydrated) given below shows that a substantial output of potassium permanganate can be obtained.

1. Mn02 content of the sample has been found to be 67.5% assayed as per BP Iodometric method, which corresponds to 43.2% of Mn. in tetravalent state.

2. Total manganese content of the sample has been found to be 43.2% as determined by bismuthate method.[6] This shows that the Mn02 content of the sample corresponds to total manganese content :

3. Chlorides	..	Traces within BP Limits
4. Sulphate	..	Nil
5. Iron	..	Nil
6. Nickel	..	Nil
7. Loss on drying at 105°c		4.2%
8. Loss on ignition	..	(in platinum crucible) 17.8%
9. Solubility in acid[7]	..	Nil (that is, insolubility)

ANALYSIS OF IGNITED SAMPLE

a) Mn02 content—62.1% which corresponds to 39.2% tetravalent manganese.

b) Total manganese content—50% which corresponds to 79.0% of manganese dioxide if available in the tetravalent form.

Hence it appears that on ignition, although the total manganese content of the sample remains unchanged, the oxygen availability of the sample as expressed by Mn02 content undergoes substantial reduction after ignition. From dilute acid extraction of the ignited sample, some quantity of the divalent manganese could be obtained.

METHOD OF MANUFACTURE

This waste product (manganese dioxide-hydrated) can be converted into potassium permanganate by the following method, worked out at the Central Electro-Chemical Research Institute, Karaikudi. Lixivation of the original sample of manganese dioxide by 10% sulphuric acid, results in the isolation of inorganic sulphates, mainly as potassium

6. Quantitative Chemical Analysis, Clowes and Coleman, 15th Edition, p. 267.

7. Ref. USP, XV, p. 1011.

sulphate, which indicates presence of potassium salts or inorganic acids derived from oxidation of gamma picoline which are rather comparatively insoluble in water and not easily separable by washing. Waterwashing of the sample followed by drying at 110°C will make the product suitable for use as a depolariser in primary batteries. Field tests alone can fix the suitability for the purpose.

The well-washed sample, when roasted in air at temperatures above 300°C. for about an hour makes the product quite suitable for production of potassium manganate. After a single or double water-washing, the sample can be treated with dilute sulphuric acid till the pH becomes one (pH=1). It is again waterwashed. Then it can be roasted in air at temperatures above 300°C., as indicated earlier. Employing for every molecule of manganese dioxide 2.25 molecules of potassium hydroxide in five hour roasting trials, we were able to realise on laboratory scale no less than 80% conversion to potassium manganate.

II. RECOVERY OF NICKEL FROM SPENT CATALYST

It has been calculated by Sharma, Bhatnagar and Kullor[8] that the total quantity of waste catalyst mud available from the vanaspati industry may exceed 625 tons per annum. In their paper, the authors have described an efficient and economical method for the recovery of nickel (of which India has no resources of her own), oil and filter-aids from spent catalyst in the vanaspati factories. The recovery of oil is effected by extracting the spent catalyst with benzene-ethanol mixture. Nickel is recovered by extraction of oil-free residue with dilute sulphuric acid. The residue after the extraction of nickel salts consists mainly of filter-aids, which after washing and drying, can be re-used. Nickel salts obtained can be put to many commercial applications without further chemical treatment.

K E Barucha *et al* of the Department of Chemical Technology, Bombay, has reported that digestion of the spent catalyst with mineral acids was the most suitable mode of recovery of nickel in the form of salts (suitable for electroplating work) and the recovery of fats by that process are said to be 90-93% and 80-90% respectively.[9] The Small Industries Organisation of the Government of India have drawn up a scheme for the manufacture of nickel sulphate from the catalyst wastes of the hydrogenation factories, 100 cwt. of waste catalyst yielding 5,000 lbs. of soft nickel sulphate.[10] Similar work has also been done at the National Chemical Laboratory, Poona, but industry has not yet taken up this problem of the utilization of spent nickel catalyst on any commercial scale.

III. PAPER FROM SANN-HEMP, JUTE STICKS ETC.

Sann-hemp and jute sticks are available in very large quantities in India. So far, these were considered as waste products and used only as fuel, freight being the only cost. Recently, however, techniques have been developed at the Technological Research Laboratories, Indian Central Jute Committee, for the making of paper from sann-hemp and similar sticks. The work is still in a preliminary stage, but this will no doubt help our national economy.

IV. HARD BOARDS FROM FIBROUS WASTE MATERIALS LIKE ROPE WASTE ETC.

In the rope and similar factories, a large quantity of raw material goes as waste which can be profitably utilized in the preparation of hard-boards etc.

8. Research and Industry, Vol. 3, No. 2, Feb. 1958, pp. 29-32.

9. Technical Digest, Research and Industry, 1947, Vol. 2, p. 217.

10. Chemical news, 1957, Vol. I, p. 321.

by incorporation of suitable binding material. Recently, such a binding material has been developed from Tar Oil Fractions at the Central Fuel Research Institute, Jealgora, by the use of which, suitable hard-boards may be economically prepared from rope waste, saw dust etc. The process may soon go into commercial production and will thus convert fibrous waste products into a product of commerce.

The above case studies can be applied in principle to other cases of waste products. By intensive scientific research, all the waste products mentioned in the table printed on page....and others may be converted into very useful products, worth many crores of rupees.

In conclusion, I would like to emphasise again that to increase national productivity, a National Committee for the utilization of waste from manufactures, similar to those in the USA and the UK should be immediately established in India. This National Council will coordinate the work already being done in this connection by departments of central and state governments, factories, national laboratories and technological institutions. Work of this character, spread over a developing country of continental size needs to be properly planned. The National Council will conduct an all-India industrywise survey of the character and quantities of factory wastes. In fact, the work of the Council will have to broaden out into the vast area of environmental sanitation. At present, as already said, factory wastes are being dumped into nearby streams wherever available. This dumping into streams will have to be checked and tested in the interests of public health. The Council will also organise scientific/technological assistance to factories for the prevention and utilization of factory wastes. It is needless to add that such a Council will be a productivity organisation of the highest public importance.

* * *

PRODUCTIVITY TECHNIQUE IN HEATING

An English firm "Thermalay Limited" has produced carpets which can be electrically heated and used in place of ordinary flooring carpets. As there is not much wastage of heat in this way and heat is equally distributed throughout the room, this method is claimed to be one of the cheapest and best, doing away with all inconveniences and discomforts of other costly or wasteful heating devices.

Communicating Productivity Techniques

HOWARD R H JOHNSON

"For hundreds of thousands of years, the human voice was the best instrument of instruction. Some 4,000 years ago, the manuscript froze the voice for later generations. But manuscripts remained rare and costly, and their precious knowledge could be imparted only to a favored few. Five hundred years ago, the invention of the printing press enormously speeded up the spread of ideas. For these last five centuries, the teacher's voice and the book have dominated learning... Finally, beginning haltingly 100 years ago, there has been an accelerated rush of new inventions—the photograph, the lantern slide, the filmstrip, the motion picture and television. The concreteness of the vast visual world is at last available—but only potentially. The development and use of the new technique require the change of old habits...crystallized and sanctified for centuries."**

TO those of us who are dedicated to increasing Productivity in India, through more effective communication, a practical knowledge of the communication process is basic to success. As with any skill, there are many methods of successful communication. There should be no competition between these methods—each media properly selected and properly used brings the goal of successful communication that much closer. The real challenge is that of *making meanings clear and getting ideas accepted.* To this end, all of us must use *all* the methods of communication and use them as effectively as we know how.

There is nothing more important in the world today than the transfer of ideas from one person to another. In this process which we call "communication" lies the potential for people of all nations to lead a happy, useful and productive life. At the national level, effective communication is the key to harmony between nations. Among individuals, it is the most important tool of daily living. And to those of us who want to make India "Productivity Conscious", it is the keystone to success.

We take the process of "communication" pretty much for granted, but do we really know how to communicate effectively? Let's consider the process of communicating in terms of "how it works". There are four primary factors in the communication process which have long been recognized by expert communicators:

1. *The Source*: a person, group of people, or even an institution. 2. *The Message*: the idea or information to be communicated. 3. *The Channel*: the means of transmitting the "message". 4. *The Receiver*: the person or persons receiving the message.

We will touch briefly on these four factors. There are several things which determine how the *"Source"* will operate in the communication process. Most important, the source must provide the initiative: the mental power to set the communication process in motion and keep it operating. How

* TCM expert (Technical Information Advisor) attached to NPC.

**Miller, Neal E, Graphic Communication and the Crisis in Education, Yale University, 1957, p. 5.

S M C R

SOURCE

- COMM. SKILLS
- ATTITUDES
- KNOWLEDGE
- SOC. SYSTEM
- CULTURE

MESSAGE

IDEAS TREATMENT FACTS

ADAPTED from material presented by Michigan State University Communication Service

CHANNEL

RECEIVER

- COMM. SKILLS
- ATTITUDES
- KNOWLEDGE
- SOC. SYSTEM
- CULTURE

successful the source will be, depends to a large extent on his ability to use the basic skills of communicating—for example: his ability to think, to speak, to write, to visualize, etc. His success will also depend on his attitude and knowledge about:

a) his audience: is it appropriate for the message?

b) the message which he is communicating: is it appropriate for the audience?

c) the social system in which he operates (the group he belongs to, his social background, and his particular role in the communication process).

Therefore, in the communication process, we start with a "Source"—an individual, or even an organization that initiates the process and keeps it going.

Message: The "Message" is that part of the process, which if received and accepted by the audience, will help the communicator reach his objective. But there are usually barriers to reaching the objective, and these should be identified and evaluated. A typical "barrier" might be a specific level of understanding within the audience, therefore the information (message) to be communicated must stay well within that level of understanding. There may be a potential negative attitude to the message—this must be taken into account by very careful selection of ideas and facts to be communicated. Each audience will present its own unique set of barriers to a message—only the man who is going to communicate to a specific audience can anticipate and plan for overcoming these barriers.

Keeping in mind the possible barriers to effective communication, the content of the message must be selected and organized:

1. Ideas to be presented must first be isolated and evaluated in terms of the objective.
2. These ideas must be tested by personal knowledge and experience, research, discussion with colleagues, and similar criteria.
3. A preliminary estimate of audience support for these ideas must be ascertained: again, in terms of the objective.
4. Finally, the determination as to how these ideas can best be presented for a given audience; by what media—The spoken voice? Visuals? A combination of these methods? A forceful approach? Or the "low pressure technique?"

This leads us to the third major factor in the communication process: the "Channel"—the chosen media for presenting the message.

Channel: Whatever the message is, it must be communicated through some Channel. The five senses obviously govern the selection of a proper channel—seeing, hearing, touching, smelling, tasting. These can be directly related to the available media for communication :

1—speech, discussion, interviewing

2—radio, recordings

3—motion pictures, television, film slides

4—demonstration, on job training

5—newspapers, magazines, books

6—exhibits, posters, flannel boards, and other visual aids.

Skilled communicators usually use a combination of channels to increase impact, audience acceptance, and audience understanding of the message. There is substantial research in the field of communication that verifies the effectiveness of using two or more channels (media) to transmit a message. It follows that complete reliance on the speaking voice as a channel, would not

be as effective as a combination of speaking and "showing" by means of demonstration, projection of film materials, use of posters as visuals, and similar aids to presentation.

The final link in the communication chain is the "Receiver"—the individual or group who either does or does not get your message.

Receiver: Just as the effectiveness of the "Source" is governed by conditioning factors, similarly the "Receiver" is governed by:

a) his skill of understanding
b) his attitude toward the source
c) his knowledge of the subject presented
d) his place in the social system: the group to which he belongs, his social and cultural background.

These are the basic factors in the Communication Process—Source, Message, Channel and Receiver. However the Process does not stop here—the phenomenon of "Feed Back" is also vital to effective communication. This is simply an awareness on the part of the "Source" as to how his message is received and accepted by the audience. The interest reflected in questions and comments, the group's willingness to follow-up the presentation with the desired action—these are illustrative of "Feedback" in the communication process. They are critically important because they provide the only firm evaluation of the success of the message. Recognizing the value of feedback, the good communicator refines his presentation until he is confident the message is getting through to the audience.

This, in brief, outlines the process of communication. The elements comprising this process are the working tools of the good communicator, whether he be manager, foreman, lecturer, or teacher. The key to effectively communicating ideas is an understanding of what really happens when we attempt to communicate to groups or one another. Walter Lippman, the famous American columnist and author, introduced one of his greatest books on public opinion with a chapter entitled "The world outside and the pictures in our heads". He argued that, although men live in the same world, they think and feel in different worlds. One observer's experience is never exactly like that of another. *The meaning of words is in people, not in the words themselves.* Information is made up of many meanings and must be communicated: to communicate effectively we must understand the process of communication—"how it works"—and use the tools of communication with the greatest skill which we are capable of. This is the key to success in personal and group communication.

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Productivity in Indian Sugar Industry

M S Srinivasan*

There are good reasons for making a study of productivity of the Indian sugar industry. The industry has enjoyed nearly 30 years of protection against the competition of cheap imported sugar. It was almost the first industry to be developed under the policy of Discriminating Protection, recommended by the Fiscal Commission, set up after World War I. This has created a large and expanding, reserved home market for the industry. There is, therefore, paramount public interest in knowing whether the industry has developed its productivity. The chart, printed on the following page, gives the answer. Product per man-day has gone up by 68 per cent in the post-war period.

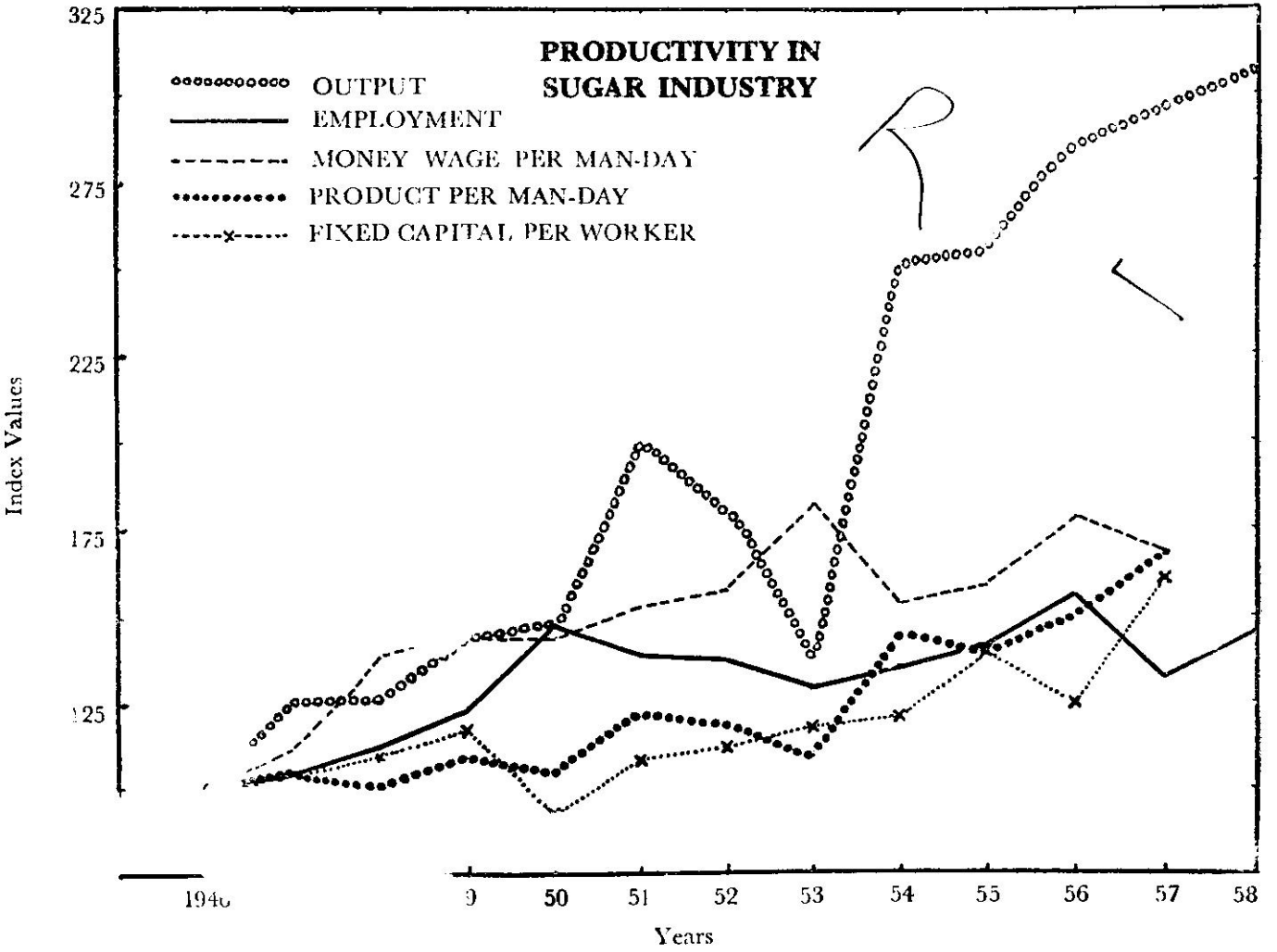
THERE is an important reason why the productivity of the sugar industry needs special study. War-time experience shows that inflationary pressure first makes itself strongly felt on an important consumption good, like sugar, which has a relatively inelastic demand. In the short period, therefore, it becomes necessary to get as much output out of sugar industry as it can produce with the existing resources: that is by the adoption of productivity techniques at every stage, in raw materials handling, crushing, processing etc.

This aspect of inflationary pressure has become even more important during the period of economic development, beginning with the First Five Year Plan in 1951. It is now well-recognised that the development of an undeveloped economy means the inevitable creation of inflationary pressures with the same consequences that were felt during the war period. Further, the investment priorities of an undeveloped economy are bound to be slanted towards the development of heavy industry, such as steel, cement, coal, electrical machinery and the like. With such a large investment programme, it is nearly impossible to spare investible resources for such industries, as sugar. Once again, therefore, the industry has to rely more on productivity techniques than on other methods of expansion.

On the side line, the subsidiary production of power alcohol out of molasses has acquired an importance, though of course marginal, in view of the severe shortage of mineral oil resources in the country. This industry produces not only sugar but also power alcohol whose annual output now may be estimated roughly at three million bulk gallons. Considering the security needs of the country, this availability of power alcohol is a stand-by of no mean significance.

The industry's importance, of course, needs not much mention. It is the second largest industry from the point of view of productive capital and third in the order of employment. From the point of view of the quantity produced, India occupies the next place to Cuba in the order of world output. The number of factories has grown from 32 in 1930 to 155 in 1958. The area under sugarcane has during the same period increased from about 3 to 5 million acres, the corresponding increase in the output of sugarcane being from 36 to

* NPC specialist. The responsibility for the statistical calculations is the author's.


PRODUCTIVITY IN
SUGAR INDUSTRY
OUTPUT
EMPLOYMENT
MONEY WAGE PER MAN-DAY
PRODUCT PER MAN-DAY
FIXED CAPITAL PER WORKER
325
275
225
175
125
Index Values
1946
9
50
51
52
53
54
55
56
57
58
Years

64 million tons. Sugar production itself has increased from less than half a million tons in 1930 to over 2 million tons. Despite the very large increase in population, the per capita consumption of sugar in the country has increased from about 6 to 11 lbs. The industry's production including gur and by-products is estimated at Rs. 135 crores. It employs over one lakh persons directly; but considering sugarcane cultivation and transport needs of the industry, its employment potential for the economy as a whole is much larger.

In view of the fact that productivity is conveniently measurable from the point of view of labour employed, product per man-day has been chosen as the basic norm of measurement. A labour productivity index has been calculated as the ratio of value added by manufacture deflated for price changes to the wages paid. The ratio of value added per worker has been computed to study the relationship between employment and creation of utilities.

To relate the labour factor to the capital employed, the ratio of fixed capital per worker has been worked out. Capital productivity index has been computed as the ratio of value added by capital (adjusted for price changes) to the capital invested.

The indices of labour and capital productivity do not necessarily indicate an exclusive trend in productivity of the two input factors. In fact, for purposes of analysis, they need to be looked at compositely (along with other ratios) as recording the variance in output in relation to capital investment and labour employed over a period of time.

This study is confined to the post-war period. It is probable that the statistics for the years immediately preceding and following Independence are not reliable but they do not seriously disturb the order of magnitudes involved. The basic source of statistical material used in this study is the Census of Manufactures, supplemented by the statistics published in "Indian Sugar," a publication of the Indian Sugar Mills Association.

The following ratios have been computed for the purposes of this study :—

1. Index of production of sugarcane = The production of sugarcane in each year expressed as index with reference to the base year 1946
2. Index of production of sugar = $\frac{\text{Production in any year}}{\text{Production in base year}}$
3. Index of employment = The number of workers employed in the industry expressed as index with reference to the base year 1946
4. Money Wage per man-day = $\frac{\text{Total wages}}{\text{Number of man-days}}$
5. Real Wage per man-day = $\frac{\text{Money wage per worker}}{\text{General price index}}$
6. Product per man-day = $\frac{\text{Total production}}{\text{Total man-days worked}}$
7. Value added per man-day of work = $\frac{\text{Value added by manufacture adjusted for price fluctuations}}{\text{Total man-days worked}}$
8. Fixed capital per worker = $\frac{\text{Fixed capital employed}}{\text{Number of workers}}$
9. Labour Productivity = $\frac{\text{Value added by manufacture (deflated)}}{\text{Total wages}}$
10. Capital Productivity = $\frac{\text{Value added by manufacture (deflated)} - \text{Depreciation—Wages}}{\text{Fixed capital}}$

The productivity study of sugar industry needs to be made, in order to be clearly understood, against the industry's economic background. An uptodate economic almanac showing developments in the industry has been appended to this article for the period under study (1946-1958). Some important economic facts about the industry have already been mentioned, but may well be recapitulated for the specific period under consideration. In this period the output of sugarcane increased from less than 47 to 64 million tons. The increase

in output of sugar was proportionately greater, not necessarily because of higher productivity which, of course, has been there as an operative factor, but because of the intricacy of relationship between gur and cane sugar. In this period, the production of sugar increased from less than 0.7 to over 2 million tons. The value of this output increased more than proportionately, which would show a somewhat strong operation of the price mechanism. In 1946, the value of sugar produced was estimated at Rs. 380 million. By 1958, the value had increased to Rs. 1230 million.

Employment in the sugar industry has recorded an increase (from 73,000 in 1946 to nearly 107,000 in 1958) but it amounts to an increase of only 1½ times, as compared to 3 times' increase in the output of sugar and more than 3 times' increase in production value. There is thus *prima facie* evidence of increase in labour productivity in the sugar industry; and the country has generally gained with more area under sugarcane and larger supplies of sugar; the per capita consumption during the period under study has also increased from less than 6 lbs to 11 lbs. The sugarcane grower has gained; for, while the price of cane in 1946 was less than a rupee per maund, it rose to nearly Rs. 1.50 by 1958. The price of sugar which was only Rs. 22/- per maund in 1946 rose to Rs. 38/- per maund in 1958.

The industry has become more efficient during the period in a variety of ways. In 1946 the industry worked on an average for only 94 days in a year; in 1958 it worked for 134 days. In the preceding year, the season was in fact longer at 147 days. The cane crushing capacity of the industry has increased markedly. In 1946, the daily crushing capacity was 1927 tons; by 1958 it had risen to an estimated capacity of 3200 tons per day. This capacity increase is associated with increase in fixed capital. In 1946, the fixed capital per worker in the industry was valued at Rs. 1805/-. By 1958, it had risen to over Rs. 3,000/- per worker.

Sugar recovery in the period under study was 9.88% in 1946 and has been for the most part around this figure, except for 2 years, when it rose to over 10%. Sugar recovery, however, is a function of many variables.

In the prosperity of the sugar industry, labour has gained in terms of a larger volume of employment and by way of a longer seasonal working of the industry. The wage bill of the industry has risen from less than Rs. 25 million in 1946 to nearly Rs. 66 million in 1958. Real wages have also increased, though not as much, for there has been a rise in the cost of living during the period.

All these economic statistics have been indexed and presented in the table printed on the following page, designed with a view to throw light on the level of productivity in the sugar industry. It will be seen from the table that product per man-day has, during the period, increased by 68%. Obviously, this has been partly due to additional investment, for the fixed capital per worker has increased by over 60% in the period. Counting all costs, and eliminating the price factor (variations in the price of sugar) the industry has achieved over 47% increase in the value added by manufacture. The contribution of labour has not been insignificant. It has varied during the period but by 1958 an increase of nearly 26% in labour productivity was recorded. This is a figure of considerable significance because productivity is essentially to be looked for in the application of labour to material resources.

It is essential in the public interest that the gains achieved in terms of productivity in the sugar industry should be capitalised and, in fact, enhanced.

INDICES OF PRODUCTIVITY IN SUGAR INDUSTRY

(1946 = 100)

Year	Production of sugarcane	Production of sugar	Employment	Money wage per man-day	Real wage per man-day	Product per man-day	Value added per man-day (at constant prices)	Fixed capital per worker	Labour productivity	Capital productivity
1947 ..	107	125	104	111	99	104	126	104	130	156
1948 ..	114	127	112	139	110	100	122	108	119	185
1949 ..	105	142	123	142	109	112	111	117	109	155
1950 ..	106	148	148	145	112	105	139	92	134	202
1951 ..	121	200	139	153	113	122	114	109	109	182
1952 ..	131	177	138	158	119	118	129	112	117	188
1953 ..	113	136	130	178	132	109	138	118	113	170
1954 ..	104	250	138	155	119	145	137	122	124	207
1955 ..	122	255	139	160	128	138	142	136	120	198
1956 ..	128	285	155	176	130	149	129	124	106	145
1957 ..	144	298	134	167	119	168	147	161	126	161
1958 ..	138	307	146	—	—	—	—	—	—	—

This would depend upon (a) a contented labour force, enjoying security of employment and a rising real wage, and (b) a rationalisation of the various processes employed in sugar manufacture, leading to a higher recovery percentage and consumer satisfaction both in terms of quality and quantity of supplies, as also a reasonable price.

The price factor brings us on to the cost factor which is a critical element in productivity. The costs in sugar industry are really not determined by market forces, as the price of sugarcane, to a large extent, wages and other forms of remuneration of labour, and the price of sugar are determined by Government regulations. The cost, therefore, to the consumer can only be brought down by a wise co-operation between the industrialists, the cane growers, the labour leaders and the experienced officers of Government. This study concludes with an emphasis on what part the human element—particularly its co-operativeness—can play in determining the most important element in productivity—the *cost factor*.

* * *

APPENDIX

Background of the sugar industry 1946-1960

The economic almanac of the sugar industry records the following important events :—

1946

1. Promulgation of Sugar and Sugar Products control order empowering Government to control distribution, movement, prices etc, of sugar and sugar products.
2. Grant of protection to sugar industry extended by one year.
3. Levy of temporary excise duty of Rs. 4.25 per maund in respect of all sugar produced.

1947

1. Extension of protection to sugar industry by two years.
2. Sugar and Sugar Products Control Order 1947 promulgated.

1948

1. Export of sugar and gur from India allowed freely.
2. Ex-factory price of sugar fixed.

1949

1. Increase in excise duty and import duty.
2. Extension of protection by one year.
3. Technical Committee to enquire into cost of production of sugarcane.
4. UP Sugar Stocks Freezing Order and Sugar Stocks Control Order.
5. Concession in excise duty for increased production.
6. Fixation of ex-factory prices of sugar.

1950

1. Protective duty on sugar industry withdrawn.
2. Sugar and Gur Control Order 1950.
3. Minimum price for sugarcane announced.
4. New Sugar policy — restrictions on manufacture of gur withdrawn.

1951

1. Revenue duty on import of sugar increased.
2. Free sale quotas released to factories.
3. Sugar and Gur (future & options) Prohibition Order 1951 banning futures and options in sugar and gur excepting forward contracts.

1952

1. New policy of reduction in cane price.
2. Levy of temporary additional excise duty.

1953

1. Banning of export of sugar and gur.
2. Import Duty on sugar reduced.
3. Abolition of additional excise duty.

1954

1. Ban on forward trading of sugar.
2. Import of sugar allowed and reduction in import duty.
3. Formation of Development Council for sugar industry.
4. Announcement of different sugar prices for different areas.

1955

1. Sugar supply position becomes easy.
2. Increase in excise duty and import duty.
3. Rise in price of refined sugar.
4. Sugarcane (Control) Order and Sugar (Control) Order.

1956

1. Draft outline of Second Five Year Plan fixing the target of sugar production by 1960-61 at 22.5 lakh tons.
2. Ninth Congress of International Society of sugarcane technologists held in India.
3. Deductions in minimum price of sugarcane on the basis of recovery of sugar from sugarcane in the interest of growers.
4. U.P. Government cess of three annas per maund of sugarcane.

1957

1. Excise duty on sugar was increased from Rs. 5.63 per cwt. to Rs. 11.25 per cwt. Import duty was also increased from Rs. 11.00 per cwt. to Rs. 18.75 per cwt.
2. The Third Biennial Conference of Sugarcane Research and Development Workers in India was held at Pusa (Bihar).
3. By the end of the year, the sales tax on sugar was replaced by additional excise duty.
4. Central Wage Board for the sugar industry was set up.

1958

1. Reserve Bank's directive to Banks to impose restrictions on the grant of credit against sugar stocks. Even in previous year the minimum margin prescribed was 35%.
2. An ordinance for compulsory export of sugar by all factories in proportion to output promulgated.
3. Ban on forward trading in Khandsari sugar banned.
4. International Sugar Conference in Geneva under the auspices of UN.
5. Adoption of metric system of weights and measures in sugar industry.

1959

1. Revised International Sugar Agreement came into force.
2. Duty on Khandsari Sugar fixed at Rs. 5.67 per cwt. on sugar by sulphitation process and at Rs. 4.41 on sugar by non-sulphitation process.
3. Tenth congress of International Society of Sugarcane Technologists held in Honolulu, Hawaii.
4. Sugar prices controlled and system of allotment for states introduced.
5. Cane-growers' strike in UP.

1960

1. Ceiling on the ex-factory price of sugarcane fixed by Government.
2. New type of sugarcane planter designed by Indian Institute of Sugarcane Research.

Incentives And Productivity

M C MITTER*

The wealth and prosperity of a nation depend not only on natural resources but also on their conversion into usable forms, whereby further value is added on to them, no doubt, at some cost. The proportion of cost to the value added is a measure of general economic efficiency, upon which national prosperity ultimately depends. Existence of natural resources is beyond control and their location and development are long term processes. Without efficient conversion into usable forms, however, they would not contribute in any way to national income. Accordingly, examples could be cited of backward and poor countries in spite of abundant natural resources while, at the other end of the scale, there are nations which attained a high degree of prosperity, merely by the process of adding value to imported raw materials, re-exported after processing.

IN India, much attention has recently been directed to the location and development of natural resources and it is in the fitness of things that attention is now being focussed on productivity, which is indisputably low, perhaps, much too low in our country. Physiological research and practical experience have, independently, proved that productivity in factory production is largely independent of race, while a hot climate has a limited, perhaps to a maximum of 15 percent, adverse effect on output, and that consideration applies during the hot season only. The major responsibility for low productivity is traceable to the generations of supervisors and administrative staff, who have been unwilling to take sufficient trouble over organising labour, presumably because it was so-called cheap labour, with the result that over all these years, the bulk of factory labour in India has been allowed to do only two to three hours of real work a day, while in the leading industrial countries, the normal performance ranges from four to seven hours in an 8 hour-shift. This is not the fault of labour, but of organisation which is characterized by lack of incentives for good, honest work.

With wages and allowances so much higher now, labour is no longer found cheap. Employers have become actively conscious of the disparity in man-hours consumed in the manufacture of any given product in India as against industrially advanced countries, with whose products those of India might have to compete in international markets. Although labour earnings in those countries are substantially higher, the gross wages in India are no longer sufficiently low to offset the difference in productivity so that even when using the same methods and equipment, unit labour costs are likely to be higher.

A point that is perhaps not appreciated generally is that low productivity is due not so much to a deliberate go-slow policy but to insufficient organisation, inefficient methods of operation, and to enforced idleness on the part of labour, primarily because of firmly established conventions.

What then must we do? Productivity cannot be increased by exhortation alone. Nor would more and newer and better machinery be the answer. These

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will undoubtedly have some effect; however, as an immediate stimulant to productivity, there are drawbacks in this concept in that there must be enough saving to pay for these machines and *any machines, new or old, will do little without the will to use them.* It is to create, foster and encourage the growth of this will—*the will to produce more*—that incentives are primarily designed. The basis of all such incentives is the provision of a strong motive in the *shape of payment by results achieved*, individually or in groups, whereby higher and higher reward, holding out the prospect of attaining a progressively higher standard of living, can be won as a result of one's personal efforts.

Types of incentives may be discussed in this context: a. *The straight piece work* system with the workers' earnings varying in direct proportion to output is the earliest system to be evolved and is by far the commonest system in use today. In this system, the industrious and skilled worker is encouraged to do his best, and reaps the full benefit of his extra effort. Direct labour cost per unit of output remains constant, but the employer gets the benefit of a decreased total unit cost resulting from a decrease in the fixed and semi-variable overhead unit costs on account of the increased output. The system is simple, is easy for the worker to understand and easy for the employer to install.

b. *The standard hour* system is basically the same as the piece-work system, the main difference being that the output is reckoned in terms of earned hours and not in the number of pieces. This confers certain advantages in wage negotiations which can be concentrated on the hourly rates instead of the standard time per unit of output and the rate of pay per unit.

In other systems, the workers' earnings may vary proportionately less than output, proportionately more than output or in proportions which differ at different levels of output. Under the first category, the Halsey, the Rowan, the Barth variable sharing and the Bedaux systems are the most widely used, the chief advantages being the relatively large incentive given for bringing up low levels of productivity up to standard, and the applicability of the systems where production standards are not set with a high degree of accuracy. Under the above systems, however, the worker gets progressively less and the employers progressively more, of savings due to progressively increasing output. On the other hand, at low levels of output, direct labour costs increase with possible adverse effects on the competitive position. Finally, it is difficult to explain or justify the reasons for sharing the savings in time with the employer. With improved techniques of work study available these days, such systems are being discarded except in small firms or in cases where it is not possible to set production standards accurately.

Where workers' earnings are made to vary proportionately more than output, a higher task is generally set and this together with the incentive to reach higher levels of output may induce excessive effort with consequent adverse effect upon the worker's health. For the employers, direct labour costs are higher than in any other system and may, sometimes, cancel all the advantages of reduced indirect and overhead costs.

Under the category of differential rates systems come the Taylor and the Merrick Differential piece rates, the Gantt Task, the Emerson Empiric with its variations and the accelerating premium systems. In these systems, a substantial reward is given even for small increases in output at certain levels and a generally large bonus on reaching the high task. These systems are somewhat complicated, difficult to install and not easy for the workers to understand.

It is not proposed to go into the technicalities or the relative merits and demerits of the various systems, but it is felt that indication of the general principles and the requirements of a sound incentive plan and the essential procedure should be of general interest. The general principles are: a. Incentives cannot be applied successfully if good relations do not exist between the workers and the management. Good industrial relations are, therefore, pre-requisite to the design and installation of an incentive system ensuring goodwill and cooperation of the workers, at whose ultimate welfare the system must necessarily aim. b. The system must be adapted to the conditions peculiar to each industry and country and should be designed for the prevailing productivity level and psychological conditions in the specific plant. It should, at the same time, include adequate safeguards to protect the interests of workers, as well as of employers. (c) The system should be developed with the agreement and, where possible, participation of the workers or their representatives and the methods to be followed in the introduction and application of the system should be subject to collective bargaining between the employers and the workers. (d) The system should cater not only for direct operatives, but also as many of indirect, and clerical workers, as technically feasible. Also, the existing wage structure should be critically reviewed to anticipate and prevent the development of anomalies in the earnings on different jobs. (e) Appropriate measures to provide for workers who may become redundant should be planned and agreed in advance between management and workers. The provision for surplus workers need not necessarily mean retrenchment. (f) The system will yield its full benefits only if all possible measures are taken to improve the production methods and processes, plant layout, equipment and management control procedures. Indeed, it is a well established fact that the major part of the productivity increase from introduction of an incentive system is mainly due to the improved organisation of work, elimination of unnecessary effort and lost time, and other sources of inefficiency and waste, arising from the systematic work study associated with it. (g) Adequate procedure should be available for speedy adjudication of any disputes arising from the application of the system or grievances regarding working conditions or other matters affecting the worker's welfare.

Under the prevailing conditions of low productivity in India, the requirements of a sound incentive system could be summarised as follows: a. A *guaranteed day wage*: The worker is protected from supervisory lapses which fail to provide work or facilities for work. b. *Accurate task and rate setting based on work study:* Past averages are no indication of reasonable performances under optimum conditions. True plant and labour capacity can only be ascertained from detailed fact-finding based on scientific methods, analysis and deduction. c. *Suitability for initially low productivity workers*: The scheme must provide immediate incentive for the first step in improvement. A task set at much above the prevailing level of activity for the initial bonus payment may prove an insuperable obstacle to improvement. d. *Sustained worker interest*: Workers' performance should be measured over as short a period as possible in order to enable them to see the results of their efforts. The workers must understand the scheme and be able to calculate their earnings and not have to wait in ignorance till the end of the pay period. e. *Simple wage calculations*: This is not only to enable workers to calculate their earnings but also to reduce the cost of operation of the system. It will be most undesirable to have to employ a large extra clerical staff, creating a permanent burden of

overheads. f. *Simple to set-up*: With low activity of labour, the scope for improvement is so enormous that the scheme initially need only be on broad lines. Great detail is only justified for raising already high outputs by means of individual piece work. g. *Levelling out of production costs*: Productivity will be found to vary widely from group to group in a factory. Time study might show that costs in Department A are very high because of the workers turning out say two hours of real work while in Department B, the costs might be low because of the workers turning out five hours of real work for the same daily wage. The scheme must not allow such anomalies, common to most plants, to be perpetuated. The labour cost of an hour of real work should ideally depend only on the wage of that job and not be subject to large variations in labour effort. h. *Wide application*: Work study should cover as many of the workers as possible. Supervision and indirect labour such as maintenance and handling men also contribute their share of effort in providing constant work and facilities to the direct workers. Ill-feeling over differences in opportunities for increasing earnings must, therefore, be avoided. i. *Generous bonus*: Niggardly bonuses cost money but yield little return, as they provide practically no incentive for greater effort than what workers have been accustomed to. Competent workers should find it possible to increase earnings by at least one-third of their present gross and exceptional ones by as much as half. But generous bonus can be safely afforded only when an expert assessment has been made of present productivity and potential improvements.

The first requirement for the success of a system of incentives, (what has already been said but is worth repeating) is that it should have the co-operation of workers which pre-supposes the existence of good industrial relations and mutual confidence. These, when absent, cannot be created overnight. It is, however, felt that identity of interest with management in increasing production, the taking of workers into confidence and sometimes in active participation, the prospect of increased earnings—all these may provide the basis of development of good relations subsequently, provided doubts regarding bonafides or fairness were not allowed to arise at any stage. As the next step, the methods to be followed in measuring output, and settling wage rates for different jobs and appropriate safeguards regarding earnings, job security and the adjudication of disputes must be agreed upon.

If incentives are to be provided for increasing productivity, the latter must be accurately measured and recorded. The exact task of the worker and the quality of the product he is to turn out must be defined so as to cover all details regarding lay-out, equipment, materials, process, machine speeds and feeds, working conditions, wastage etc. having a bearing on his task. It is extremely useful to have a work study carried out with a view to drawing attention to unnecessary, ineffective or wasteful methods, operations and procedures which could be eliminated or improved leading to the most effective use of materials, plant, equipment, manpower and other resources, before laying down the precise job description. Having determined and defined how a particular job is to be done, the measurement of the work content of the job in terms of the human effort involved can be taken in hand. Most modern methods of work measurement require that the task be broken down into its constituent elements, grouped where necessary, each element or group being rated and timed separately. Other methods which are applied where indicated, involve the use of synthetic time standards, predetermined elemental time data or activity ratio data obtained by the application of statistical sampling me-

thods to industrial activities and stoppages. The work study also furnishes data about the prevailing index of machine performance and productivity, indicating the potential improvement anticipated, which determines the type of incentive system to be designed.

The determination and precise definition of each job then enables a job analysis and job evaluation to be carried out. This procedure determines the qualities required for the efficient performance of each job and assesses the relative worth of the qualities required for the various jobs of differing skills and responsibilities. Major anomalies of jobs of similar calibre, currently paid at widely differing rates or jobs of high calibre, currently paid at lower rates than some others, supposedly but not actually of higher calibre, are revealed, and the jobs properly placed within a range of grades in accordance with their true relative worth. These can then be expressed as specific values on a properly constructed basic wage structure. This procedure guarantees the equitable distribution of the total wage fund amongst all the jobs of differing skills, efforts and responsibilities so that each job is assigned a share proportionate to its contribution to the process of production.

Finally, the incentive bonuses are so designed that the earnings are linked to productivity, enabling a worker to earn the desired amount or proportion above the minimum guaranteed wage which is normally subject to collective bargaining. The system is then ready to be introduced for a trial period. Minor modifications or changes found necessary are referred to and agreed upon by workers and management and the system finally adopted. The substantial contribution that a properly designed incentive scheme makes to the increasing of productivity, reduction of costs of production and increased earnings for workers has come to be generally recognised. Amongst other advantages are that in general, less direct supervision is necessary to maintain normal levels of output and attention of both supervisors and workers becomes directed to reduction of lost time and making more effective use of facilities available. In most cases, the system enables labour cost to be assessed more accurately enabling the application of modern methods of costing and management control.

Certain disadvantages can also be cited but practically in all cases, these can be eliminated by careful planning and provision of necessary safeguards. Amongst the major disadvantages is the fact that there develops a tendency for the quality of products to deteriorate in the stress on quantity. This is especially the case where high tasks are set, requiring the worker to increase output substantially for earning the bonus. Quality also suffers when supervisory employees are included in the same system and are therefore inclined to overlook substandard work. However, these pitfalls can be avoided by proper design of the system, precise definition of the quality of product required to be turned out and a strict system of inspection and checking. The latter may involve some added expenses and must be taken into account in reckoning the cost of operation of the incentive system.

Arguments are sometimes advanced that incentive systems endanger the health, efficiency and morale of workers, and that accident risks may be increased due to insufficient attention to security regulations under the stimulus of incentives. These arguments may hold good when the task is set too high and the guaranteed minimum wage, too low—factors which can always be avoided in proper systems. Furthermore, incentive schemes can always be designed to taper off the stimulus at high levels of output where the worker has to make sustained heavy effort, endangering health and morale. Prevention

of overwork due to working during breaks and observance of security precautions are essentially supervisory functions and must always be fully discharged.

Some labour unions look upon incentive schemes with disfavour as the wide differences in capacity for work amongst workers and consequent wide disparity in earnings are thought to generate ill-feeling and reduce solidarity. However, if it is accepted as a basic principle that the opportunities for increasing earnings should be afforded to all and thereafter, a worker should be free to enjoy the benefits of his own personal efforts, this particular question should not arise.

Lastly, there might be a curb on high production and high earnings due to a feeling that rates might be cut if workers earn comparatively high wages over prolonged periods. Also there might be a tendency to oppose introduction of new methods or machinery, necessitating review of the job and its bonus, which in the workers' mind affords opportunity to management to reduce earnings. These fears are easily dispelled by the establishment of mutual confidence, prior agreement on the method of review and assurance against rate cutting as such and the demonstrable fairness of the system, the task set and the bonus rate.

On balance, the advantages of a properly designed system, introduced after due consultation, agreement and careful planning will far outweigh the disadvantages in a wide range of industrial operations. It becomes one more demonstration of the basic identity of interest between management and labour to make full and efficient use of available resources from which can flow higher productivity, better earnings, facilities for workers and good labour-management relations. In conclusion it is desired to stress that the stimulus and opportunity which the design and installation of incentive schemes provide both to management and workers to improve organisation, methods of work and thus raise productivity, contribute far more towards the realisation of the objective than the mere financial incentive. Higher money rewards are, of course, necessary and they will come alongside higher productivity. The fact really is that for ages, the Indian economy has been by and large a non-incentive economy; and a non-incentive economy is decisively an unproductive economy.

* * *

"There is, in fact, an enormous amount of goodwill and desire to help. But we have not begun to draw on it, for we have never before had a working method by which all the ability represented in a group could express itself. Not having had workable techniques to bolster our good will, we have bungled in our efforts to use it. We have had votes by the majority, with a lively and rebellious minority tagging along. We have had plans and decisions 'explained' by those at the top rather than any shared progress toward those plans and decisions."

From News Ways to Better Meetings by Mrs. Bert and Frances Strauss.

Pre-Requisites For Higher Productivity

J L RASTOGI*

The urgency of an increase in productivity in Indian industries to improve quality, reduce costs of production and stabilise and even enlarge markets cannot be over-emphasised. Goods today are produced on a large scale in industries involving huge investment and considerable employment. These are sold not only in national but in international markets. The success of any industry, therefore, depends on the effectiveness and continuation of the demand for its products. These are, in their turn, based on the quality of its products and cost of producing them, that is, on its competitive capacity both in home and foreign markets. An improvement in productivity is more needed today than in the past, in order to maintain our dwindling exports, with a view to earn foreign exchange to finance our development plans. In spite of rapid industrialisation in the post-war years, India has failed to push through her goods in the world markets. Countries like the UK, the USA, Germany and Japan are in a much better position to meet the needs of under-developed countries. Challenge is also forthcoming from China and Pakistan, while development of industries in countries which were formerly our customers has adversely affected our exports. The most important reasons for losing our export markets have been high cost of production and poor quality. Even in home markets, consumers are paying high prices for low quality goods. Therefore if the export markets are to be retained and enlarged and internal consumers satisfied, these maladies must be remedied without loss of time. The most effective means to improve quality, reduce costs and simultaneously raise the standard of living is to improve productivity through maximum utilisation of resources and avoidance of waste.

IN India higher productivity is generally confused with intensification of work. Therefore any move towards greater productivity is regarded by workers as against their own interest and well-being and looked upon with suspicion. They oppose any productivity drive on three grounds :—

(a) It entails retrenchment of a large number of workers who have so far been gainfully employed.

(b) It leads to an increase in workload, and

(c) The gains due to higher productivity are appropriated by the employers without providing any relief either to labour or to consumers.

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However, the confusion of workers in this regard has been partly due to misconception and partly due to the way in which Indian management tries to initiate programmes of productivity. Workers in our country do not enjoy the benefits of proper education and training. Under such circumstances, their aptitude, initiative and interest in work remain undeveloped and they fail to cope with the changing needs of industry and the national economy. They are, thus, unable to appreciate that higher productivity besides paying higher dividends will also benefit them in terms of less strain, higher wages and cheaper goods. A productivity drive does not aim at the maximum exploitation of labour; rather it leads to the maximum utilisation of all the

agents of production: men, materials, machinery and management. Productivity has been defined as 'the ratio between the output of wealth produced and the input of resources used up in the process of production'. The object of productivity movement has been to increase the ratio of output to input. Therefore it is not labour alone but also other factors of production which have to contribute towards greater productivity.

What is most desirable in this direction is the creation of a cooperative climate in industry and a psychological change in employers, management and workers. Productivity should be considered in its true perspective. It should no longer be regarded as a means of exploitation of labour. Industry today is not a venture of the employing class alone. It is a cooperative enterprise and different agents of production contribute in their own way towards productive effort. The success of the enterprise, therefore, cannot be attributed to any one of them. It depends on how different factors are coordinated to yield the maximum returns. Thus both management and labour must recognise the true contribution of each other. Maladjustments caused due to industrial revolution viz., distance in employer-employee relationship, specialisation and loss of satisfaction and pride, must be remedied; and each factor must be accorded an honourable place in the national economy and given adequate reward for its effort. Outdated ideas of conflicting interest must yield place to community of interest. Labour must be recognised not as a mere pawn on the industrial chess board but as an equal partner in industry. Management must act as trustees of workers' interests and well-being. In order to gain the whole-hearted cooperation of workers, their fears and prejudices must be appreciated. Labour has to be made productivity-conscious. Workers should be explained the importance, need and benefits of higher productivity and assured that steps taken to achieve it would not undermine their interests, but would instead benefit them in the long run, and very likely, in the short period also. An honest scheme of incentives, efficiently administered, might with great advantage be integrated with a productivity programme. In this direction trade unions can render immense service by giving the workers true guidance and training.

We may in this context discuss the problems of rationalisation and modernisation and their place in our productivity drive. These are also important pre-requisites for raising productivity in industry. Rationalisation is "scientific planning which attempts at replacing routine and empirical policies by scientific methods. It relates both to technique as well as organisation and is designed to secure minimum of waste, both of effort and material. Rationalisation therefore should not be understood in a narrow but in a comprehensive 'productivity' sense, as inclusive of production planning, time and motion study, quality control, improvement in layout and conditions of work and scientific selection and training of workers. Besides, it calls for an improvement in various other aspects of the economy like management, finance, transport and marketing. It is true that this rather stretches the traditional meaning of rationalisation, but in the Indian economy, it is socially necessary to give rationalisation this wider connotation. As such, productivity would be inconceivable without rationalisation, as explained above.

However, the successful implementation of any rationalisation programme depends on the quality of the management. Management in India is not attached the same importance, as it is in the West. In theory, the management of an industry in our country is vested in the Board of Directors. But in

actual practice, frequently, it is the managing agents who are responsible for conducting the whole affair. Besides, the other managerial staff comprises of works manager, departmental heads, junior executives, supervisors and foremen. In advanced industrial countries, managerial personnel are generally technical experts, having specialised in their own fields of activity. Their respective jurisdictions and responsibilities are clearly defined. However in India, management has not been organised on scientific lines. Managing agents have assumed more or less a hereditary character, irrespective of the knowledge and experience for the purpose. Inspite of the highly technical nature of the job of a works manager cases are not uncommon where non-technical hands have been appointed as works managers. Even in the appointment of junior executives, supervisors, foremen etc., favouritism rather than experience and competence are the criteria for selection. Duties and functions of various types of managerial and supervisory personnel have not been laid down and they have to perform multifarious functions. The result has been that the managerial personnel have failed to view the work in its true perspective, thus perpetuating allround inefficiency and high cost of production. Any programme to introduce rationalisation in industry should begin with the rationalisation of the management; because only a trained and enlightened management will be in a position to introduce rationalisation in other aspects like production, finance, transport and marketing with the least opposition from other factors.

Modernisation of equipment and work environment is the necessary corollary of any rational programme for raising productivity. While complete modernisation has been effected in the industries of the UK, the USA, the USSR, Germany and Japan, it is yet to take place in almost all Indian industries. One of the most important reasons for low productivity in Indian industries has been that equipment in most of them is either outdated or dilapidated or unbalanced to make the working of the unit efficient and economical. In fact we are years behind the West in this direction. Our industrialists for the most part do not know the technological improvements in equipment and processes of manufacture. The National Productivity Council has made a good beginning in this direction by sending productivity teams abroad. Efforts are also being made to improve the situation by increasing the output of capital goods inside the country and by relaxing import regulations wherever possible.

Apathy of management towards technological changes and installation of new machinery is sometimes due to opposition from workers. Labour objects to such a move due to fear of unemployment. Such fears should be met by informed argument, for it is not always justified, particularly when new machinery is installed to make a unit balanced; instead of creating unemployment it opens opportunity for more employment, besides leading to economical production. Unemployment, even in the short period, has to be avoided. It can easily be surmounted by taking suitable remedial measures. Vacancies due to natural wastage viz., due to death, abandonment, retirement —whether caused by super-annuation, prolonged illness, incapacity or disability should be set off against workers rendered surplus due to modernisation. An effort should also be made to absorb surplus labour by transferring them to more or less similar jobs within the same factory or to other units which can absorb more of such labour. Training facilities should be provided to surplus personnel to make them mobile and adaptable to other jobs. In the interest of national economy, possibilities of a shorter working week may be examin-

ed. In such a case, a rise in productivity due to modernisation should be adequate to offset the loss in wages due to decrease in working hours. In absorbing surplus workers, their interests should be fully safeguarded. Their remuneration should in no case be decreased. Besides, in order to gain the sympathy of workers, the necessity, implications and probable effects of technological changes should be clearly explained to workers, as already suggested.

The best method for improving productivity is the direct association of labour with any such scheme. The most common way of associating labour with such a task will be to invite workers' suggestions.[2] Whenever any improvement is devised or vital changes contemplated in management techniques or production, workers should be invited to offer free criticism and effective suggestions. It will enable workers to clear up their grievances and misunderstandings. For the convenience of workers, suggestion boxes should be placed near at hand. Suggestions should be collected and scrutinised by the management and placed before a joint committee of management and labour representatives. If found to be satisfactory, they should be given a trial for sometime; and if found useful, they should be adopted to benefit the employees and the enterprise. Those whose suggestions are adopted should be adequately rewarded as a token of their knowledge and experience. If any suggestion is found not very useful, the reason thereof should be promptly communicated to the person concerned. The very fact that the workers are consulted and their suggestions are given prompt attention and adequate rewards, will encourage workers to extend their unreserved cooperation to any move for raising productivity.

A more effective method for associating labour with any productivity programme is through the formation of joint worker-management committees[3] and entrusting them with some of the advisory, supervisory and executive functions. Advisory functions of these committees should embrace discipline, recruitment, transfers, promotions, layoffs, retrenchment, rationalisation and modernisation, consideration of workers' suggestions etc.; while supervisory and executive rights of these committees should extend over welfare and safety measures, vocational training and apprenticeship, preparation of schedules of working hours and breaks, payment of rewards for valuable suggestions, disbursement of wages and salaries, job analysis, time and motion studies and drawing up of standing orders. Such an association would make the workers feel their place in industry and enlist their full cooperation.

However, mere labour participation in a productivity programme is not all. Proper incentives to which a reference has already been made, should also be provided to get the best out of each worker. Wages should be related to the actual work performed. As productivity gains are a result of joint contribution of various agents of production they should be apportioned between them and each agent should be adequately rewarded for its sacrifices and efforts. No one should gain at the cost of others. In order to secure the sympathy of the public to any productivity programme a portion of the resultant gains should be allowed even to consumers in the shape of lower prices.

Sometimes certain non-monetary incentives may be even more effective in improving worker's efficiency. Workers, like all human beings, have their own aims and aspirations, preferences

2. See page 220 of this Journal for an excellent article on Suggestion Schemes.

3. See Sri B N Datar's article on Labour-Management Cooperation, Productivity, Vol I, No. 3, p. 10.

and prides. In order to secure their best, therefore, their prides and aspirations must be respected and steps should be taken to ensure that these find expression in their work. The best way in this direction would be to recognise the contribution of each worker and reward good work. It will give him a satisfaction and pleasure from his own work, encouraging him to improve his efficiency and productivity of the concern.

Security of service is the most important concern of workers. Hence there should be a fair guarantee of stable employment. Moreover they should be properly designated and workload should be scientifically determined. These will go a long way in combating confusion and misunderstanding among workers which would ensure that the management is interested not in their exploitation but in their optimum well-being.

Besides, a systematic plan of promotion is one of the most effective incentives to workers to stay and work wholeheartedly. It is a method of recognising merit, ability and experience of workers and a reward for loyalty and high productivity. Basis of promotion should be clearly laid down in order to avoid confusion and heart-burning. Normally, skill of workers and their productivity should govern the decision as to who are to be promoted. But where merit, knowledge and efficiency are equal, seniority of service should be the deciding factor.

Last but not the least important factor for raising industrial productivity is a proper system of education and training of workers, and also of managerial and supervisory personnel. Particularly in India, this is of special significance. Scientific organisation of education and training of workers will be an aid to higher productivity by creating a better understanding of the work, workshop and factory rules and one's place in the enterprise and enhancing workers' mobility and adaptability. It will also prepare workers for effective collaboration with management and generate productivity consciousness. Thus any programme for raising productivity must be preceded by a well coordinated scheme of workers' education and training. It should include general education up to a certain extent, vocational education, technical training and induction courses and education in productivity—its concept, techniques and devices. General education will provide the basic knowledge of the subjects of every day life and various aspects of national aspirations, achievements and citizenship training. Such an education will make workers responsible and broaden their outlook. Vocational education will help in developing and exposing attitudes, talents and preferences of a worker on the basis of his physical and mental capacity while proper technical training and apprenticeship will provide him an opportunity to learn how to perform his job most efficiently and economically. Induction courses will introduce new recruits to actual work, work environment, factory rules and discipline and education in safety engineering. They will also provide a wider knowledge of the activities of the firm, its policies and services to the community. Education in productivity will educate workers regarding the need and importance of raising productivity and methods and techniques of doing it. Besides, regular reorientation courses should be undertaken from time to time to enable workers understand and appreciate the view point of the management with regard to higher productivity and adapt themselves to the changing needs of industry and time.

Proper education and training of foremen are more important in any programme of raising productivity; because they are the persons who come into direct contact with the actual workers. They must be provided adequate train-

ing not only as how to perform their technical duties most effectively—but also how to coordinate the activities of different individuals under them and get the best out of each. They require education in leadership and human relations. The task of foremen should be properly defined and they should be relieved of the task of educating and training new entrants. The latter step would leave them with adequate time and energy to look after the needs of workers and help them improve productivity.

The responsibility for the success of industry finally rests with the management executives. They are not only responsible for planning of production and work but also for their proper execution. They have to coordinate not only the task of different departments of the concern but also various aspects which are essential for the success of an industrial venture, like purchase of raw materials, stores, production, finance, transport and marketing of finished goods. In fact the productivity of a concern depends on how these various aspects are coordinated to ensure the best results. Management is thus a highly technical and specialised affair, requiring wide knowledge and experience. For the successful working of the concern, management executives require both theoretical understanding and practical management training. However, as management today is a neglected aspect in our country, an intensive effort should be made to ensure adequate supply of trained managers and executives. Lately, Indian universities have begun to realise the importance and need of specialised management courses and some of them have already started on a new venture by organising advanced courses in Business Administration. But these courses are highly theoretical and seldom give an understanding of the practical problems and methods of solving them. Thus in order to produce full-fledged and progressive managers and executives, a close liaison should be established between the universities and the industry, and the latter should extend their unreserved cooperation for training of candidates in managerial approach, practices annd problems. Again in order to speed up the task of management education and training, central, regional and local Management Associations should immediately be formed to hold periodical technical meetings and management conferences and for the exchange of views, information and progress achieved in this direction. Besides, Local Management Associations with the assistance of the regional and central associations should start short-term courses for management training; and every concern should take advantage of the facilities thus offered by sending some of its executives to these courses. A beginning, although very small, has been made in this direction too. Local Management Associations have been organised at various industrial centres to arouse the interest of people towards managerial jobs and education.

However, only education and training of various types of personnel cannot alone enhance productivity. Much depends on initial selection. In order to get the maximum from each employee, work has to be assigned according to temperament and capacity. Vocational and psychological tests should be organised and the best qualified person must be selected for each job. Scientific selection and proper training will create a sense of attachment and increase the productivity of the concern. These may appear small points, but they would be the major determinants of the success of the productivity drive, launched by NPC.

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March 31, 1960. *Signature of Publisher*

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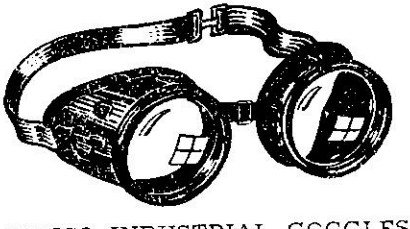

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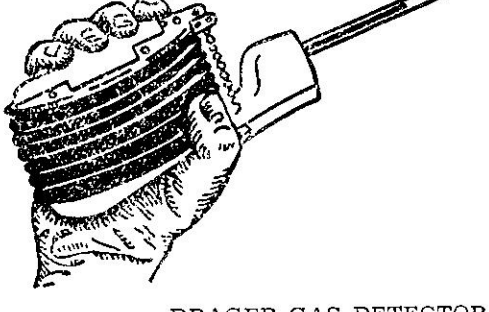

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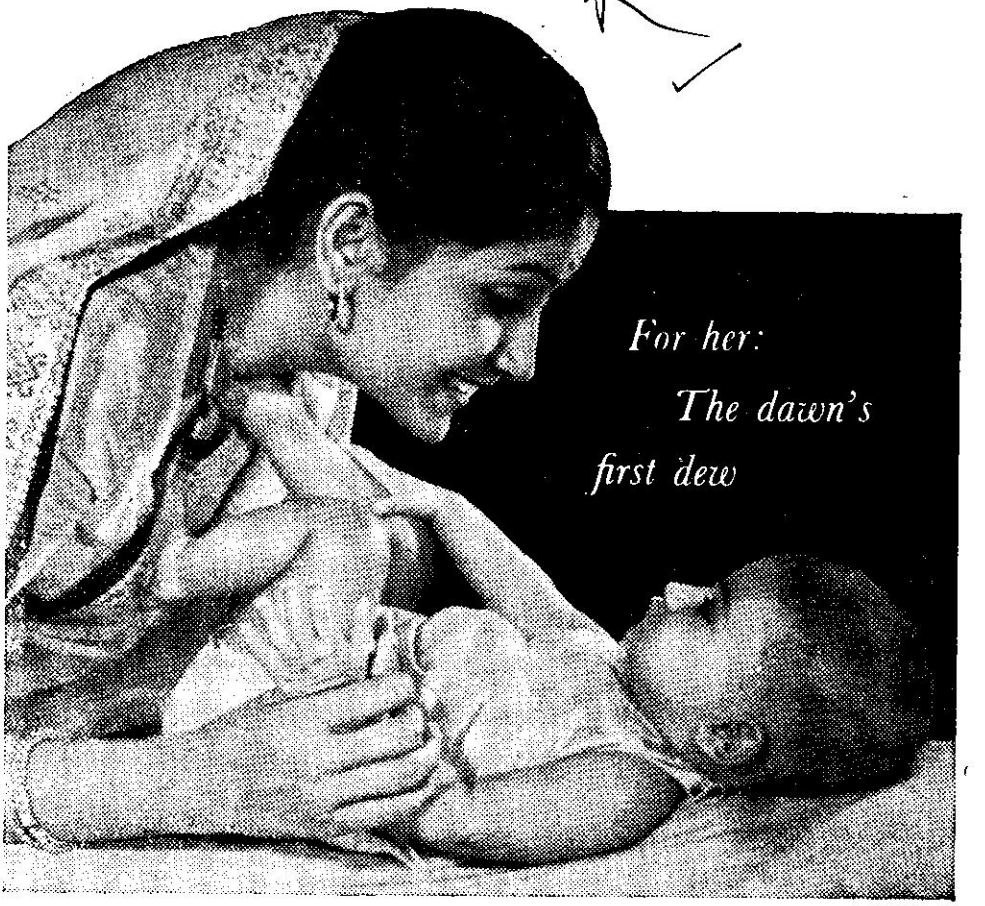

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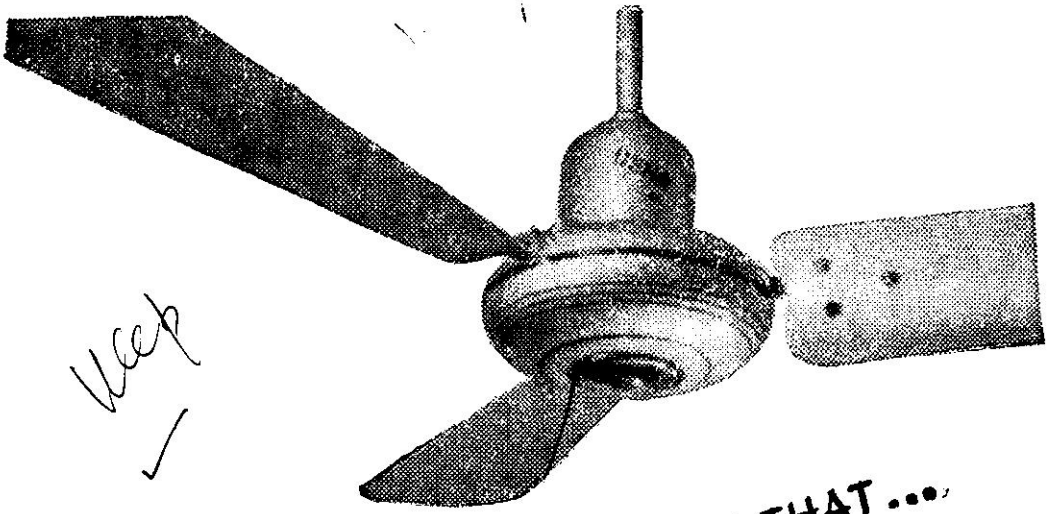

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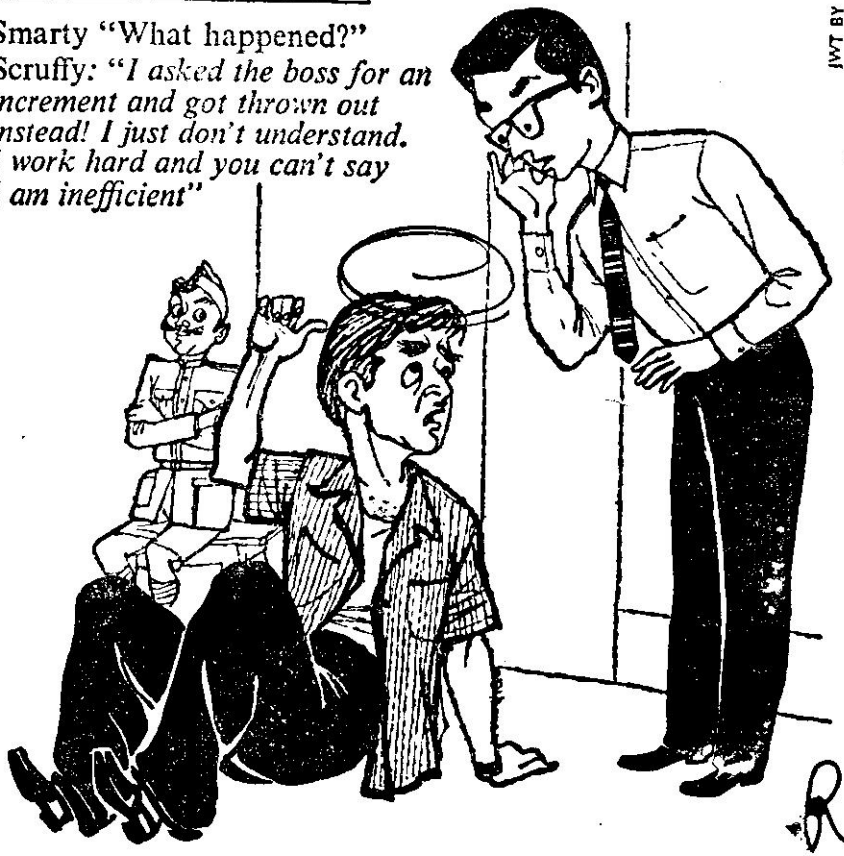

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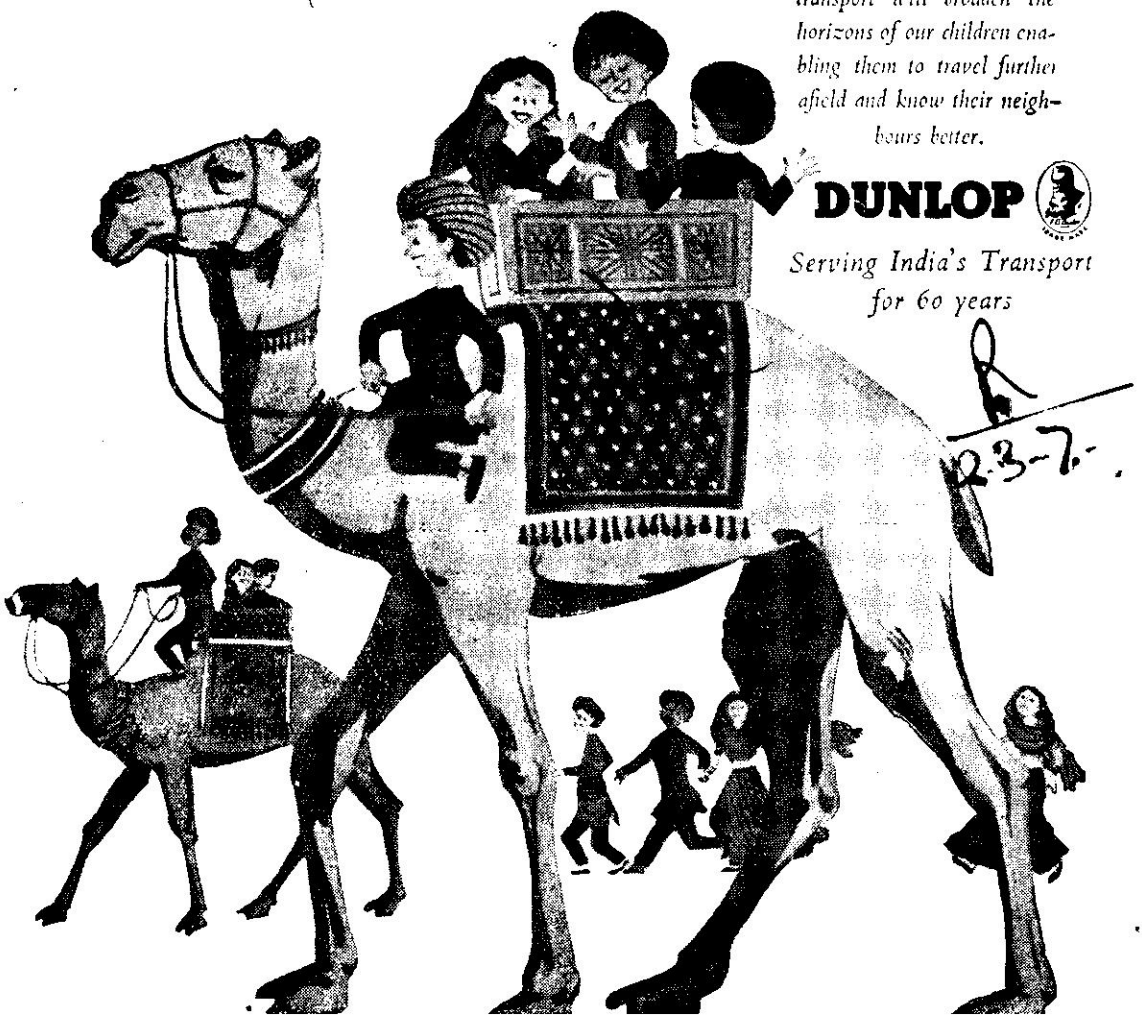

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