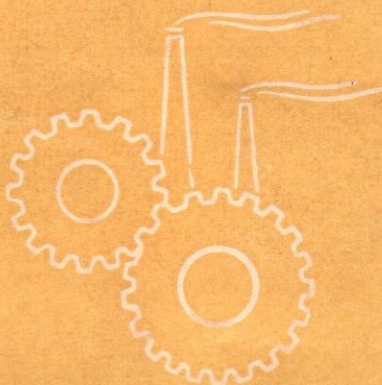


PRODUCTIVITY

JOURNAL OF NPC

8



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 !

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“... Mere eating of bread is no more the sole aim of man. He has opened newer and fresher vistas of progress before himself. He has begun to ask for a number of things, besides shelter, clothing, education, medical aid etc. And more than that, he has perpetually fought to obtain more bread for less sweat, by developing appropriate skills. These skills are represented by the philosophy and methodology of *Productivity*...”

Rashtrapati
Rajendra Prasad

“... I commend the work of the National Productivity Council. It is obvious that higher production is vital for us and we must explore all avenues which might lead to this desired objective....”

Jawaharlal Nehru

Priorities in Productivity

IN any area of social or individual adventure, planning is essential to success, particularly against the background of a fast current of social change; and planning means laying down the order of priorities and the marshalling of resources to fulfil the priorities decided upon in the time allocated for given ends.

For the success of the Productivity Movement, as for other social ends, we need to lay down a time schedule of priorities according to which the objectives of the National Productivity Council may be as expeditiously achieved as resources permit.

If we go over the parameters of the whole industrial system which comes within the jurisdiction of NPC in regard to the enhancement of productivity, we shall come to realise the magnitude of the task to be accomplished. A choice has necessarily to be made where NPC may concentrate its resources with a view to achieve the maximum results in the shortest possible time. There is the large area of the private sector. On the other hand, a rapidly expanding public sector is opening out, with large chunks of investment in heavy industry, particularly iron and steel and multi-purpose projects, which have an important industrial aspect. It will be an infinite gain, if productivity is from the beginning built into the public enterprise system. Those in charge of the Productivity Movement have necessarily to think out where the application of productivity techniques will yield the best results. Of course, we must make the whole area receptive but at the same time, we have to avoid spreading our resources too thinly. A decision has to be taken as to the selected areas of massive impact in the public sector and in the private sector.

We have further to consider the allocation of resources between new industries and the traditional industries which have by now more than half a century of industrial experience. The new investments constitute a very large area of a fast developing economy; and it would be easier to introduce productivity techniques, as investments actually fructify. In the traditional industries, too, there is scope; and they have not to be neglected.

Decision-making with regard to the settlement of priorities for the productivity drive, however, does not end here. Resources have to be divided again between large, medium and small scale industries. Many of the large industries can themselves afford the employment of productivity experts. Medium scale industries may also be in a position to employ an industrial engineer; and if he is a live-wire, he could certainly do much. But medium scale industries do need some attention in this respect. On the other hand, small

scale industries present problems of a rather unusual nature in the application of productivity techniques. Yet it is this area to which public policy is rightly inclined; and it is the small industrialists, who would in their own interest welcome the entry of productivity experts from an all-India body like the National Productivity Council.

After these choices are made, a further position has to be taken, whether larger resources may be devoted to the training of management in the application of productivity techniques or carrying conviction to the working class as to the essentiality and desirability of their cooperation in the implementation of the productivity programme. Here probably, we shall have to try a simultaneous approach, for while decisions regarding introduction of productivity techniques have necessarily to be taken by management, their implementation is difficult without the active cooperation of labour. We have therefore to carry both together. While we must continue our management training programmes, we must simultaneously attend to the education and training of the working class and create among them a feeling that the Productivity Movement is something by which they stand to gain entirely.

In the matter of training, again, we must have something to teach. There has been hardly any research done in this country on the economic and technological aspects of productivity. The general economic background is, of course, well-known. Studies have been made of certain industries; and there have been a few sociological research projects carried out in the field of industry. But research in productivity, as such, has been more or less absent. How far can the National Productivity Council organise research on its own or encourage and stimulate other research organisations to undertake productivity studies? This is a question that has to be seriously considered.

As regards the learning of foreign techniques, foreign aid is available. But this programme has its limitations, as of course, also its advantages. A number of senior men have gone out in a wide variety of lines to learn what they rapidly can, of productivity techniques within the sphere of their own experience. A number of technicians have been and are being sent to various advanced countries to learn the techniques of production in several lines. This appears to be a promising field, but it needs evaluation.

Probably one of the best programmes in this connection is the organisation of in-country teams. This would, of course, require resources on a scale, for these in-country teams would cover the whole country and a wide variety of interests. Labour needs to be brought in significantly into the in-country teams. That would make them feel that they have a place in the industrial system. It would lead to a realisation among the leaders of the working class that it is the highly productive concerns which are really in a position to pay more than normal wages. The direct relationship between productivity and the wage level would at once become clear.

What we really need is a sort of a general movement: a change in social attitudes, leading to the conclusion that *productivity is everybody's business*.



Sharing The Gains of Productivity

P S LOKANATHAN

The problem of Sharing the Gains of Productivity has acquired a topical importance in the present context of labour's attitude to the adoption of productivity techniques. But in a way it is neither fundamental nor of long term importance. It is a passing phase in our economic growth towards a highly developed society. When the general level of productivity rises, not only will the whole community but practically every individual and every section of society gain so distinctly that the problem of sharing the gains in finer proportions will have lost its sharpness.

THE fundamental problem really is the development of social attitudes so that every person, no matter what work he does, behaves and functions as a very efficient member of the organisation in which he works. It is the creation of an urge to higher productivity that is important and which may prove difficult. Once we get going on the road of productivity, the problem of sharing its gains will lose its toughness which is so apparent at this moment of discussion. High productivity will be reflected in a variety of ways, not only in the total and per capita output but also in a high level of wages. No management, anxious to survive and to prosper in a competing economy, or even in the public sector, anxious to show continuously improving performance, would like to lose highly productive workers because of the high wages that they are able to command.

The most essential point, therefore, is that in the planning and working of a factory, there should be a general atmosphere favouring productivity, and the question of the manner in which the gains of productivity would be shared, be regarded as only a part (and

not even a major part) of the general problem of increasing productivity. The creation of this sound atmosphere is the most important task of Management, whose specific function it should be to see that the whole of the factory is oriented towards higher productivity.

There are some employers who take a narrow view, and argue that if increased productivity is due to installation of a new or more efficient machine, all benefits should go only to capital. Even assuming that such a view is correct, it is not fair. The very fact of increased productivity should be the basis for sharing the prosperity of the concern. The attitude towards this should be one of cooperativeness. It is obvious that the mere introduction of a new machine cannot by itself bring about increased productivity, unless the workers cooperate to use the machine and maintain it properly. The idea that capital investment can be separated from the cooperative work of labour is unrealistic. There is hardly any work which is not the resultant of all the factors of production of which labour forms a major part.

If this is understood and accepted, it becomes only a matter of detail as to how to share the gains of productivity. Where, of course, the gains are measurable in terms of quantity or in terms of value, the question of proportions becomes easy. But it is quite possible that the gain is an overall gain, not attributable to any particular group of workers in which case, sharing has necessarily to be on a production basis in terms of the overall product.

On the other hand, it is possible that the gains may be very definitely measurable and attributable. In that case, the problem becomes technical, that is, a question of fair measurement of productivity. To the extent to which the problem is reduced to a technical level, sharing becomes easier. It is, therefore, essential for organisations like the National Productivity Council to organise research on the techniques of measuring the gains of productivity.

Apart from the not insoluble technical problems involved, there are vital social issues at stake. It should be unequivocally agreed that in industries and in firms where the current wage is below the minimum wage, the first claim on increased productivity should be that of a rise in wages to the minimum wage level. In such cases the employer would have to wait for his share in the gains of productivity. In cases where the wage is between the minimum and the fair wage, the employer would be entitled to recover at least the cost involved in the application of productivity techniques.

In industries and firms where a fair wage level obtains, labour and management could negotiate on a somewhat free basis, for obviously in these cases the firms are pretty well off, investors and workers each as a class earning a fair reward; and the firms are operating under favourable market conditions. Here probably a fifty-fifty share in the

gains of productivity would be fair, though it has no particular sanctity, but what the total gain is, may require detailed study.

It has after all to be recognised that the decision-making process is centred in the management, whose prime function is to secure a surplus from current operations. The larger the surplus, the higher would be rated the efficiency of management. Management itself needs an incentive, just as labour or anybody else. It has to be motivated to take decisions which should result in higher productivity. If all the gains in productivity were to be appropriated to labour, management would, in fact, become lethargic.

The above conclusion may perhaps be given a statistical shape, as a method of approach.

	percentage share	
	management	labour
Where the wage is below the minimum wage	0	100
Where the wage is between the minimum and the fair wage	20	80
Where the wage is at or above the fair wage level	50	50

These are broadly the lines on which any sensible person would think on the problem. There is no mathematical precision about these percentages, but they indicate broadly a reasonable order of magnitudes.

It may be stated quite firmly that, difficult as the problem of sharing may seem to be in reality, it is far less difficult than the other problem of determining the gain to be shared and how to measure that gain. When once this magnitude is ascertained and some analysis done of the factors that have contributed to or cooperated in the gain, half the battle would have been won. It requires only a reasonable

frame of mind on the part of trade union organisation and management to establish a formula for division.

The question really is neither strictly mathematical nor economic. It is a question of social attitudes: unfortunately, but factually, the capitalist and the working classes regard each other as a distinct species of humanity, with interests that are totally divergent. While this attitude is a fact, there is the major and unalterable fact that all classes of people have to subsist on the fruits of the economy.

Further, the paramount social objective is to build up a progressive economy. The working class surely has no incentive to work unless it gets a commonly accepted minimum. On the contrary, if such a minimum is not somehow secured within a reasonable period of time, it might even be difficult to hold the community together. From a wider social point of view, therefore, what may be called the non-working classes have a positive material interest in seeing that workers get a certain minimum to live upon.

That is why I have suggested that in case number 1 where the wage is below the minimum wage, management should forego any share in the net gains of productivity after allowing, of course, for any increased costs. This will serve a number of purposes. The interest of the working classes in raising productivity under such circumstances becomes absolute, and probably higher productivity would result in a shorter

period of time than most people can imagine, for there is a margin of effort which everyone can put in and this will be fully forthcoming, if a man is promised some minimum standard of life for himself and his family.

Thus a rise of wages to the minimum wage level would be rapidly paid for by increased productivity itself and the management, for foregoing its share in the gains of productivity, would have made an investment of an extraordinary character in the goodwill and contentment of its workers. This is good business. Hence this scheme of sharing the gains of productivity is not idealistic. It is based upon business considerations and the long-term social interest of all classes of the community.

In an economy such as ours, operating at such low levels of productivity, it should be immediately possible over a fairly wide front to link up increased productivity and higher remuneration for workers. If a bus driver, for example, also works as a conductor, as in West Germany, the UK and the USA, he should be straightaway entitled to at least a part of the remuneration payable to the conductor.¹ As road transport is going to expand very considerably, there should be no fear of reduction in the volume of employment. All that would be necessary is to train up persons to work simultaneously as drivers and conductors and earn practically double the wages.

The above may be difficult for some time, but the combination of a bus

1 "...for example, Wilts and Dorset Passenger Service (UK) operate a bus with one driver without a conductor, the driver being provided with a machine to issue tickets and paid a compensation of 15% extra on his basic wage..." NPC Report (number 3) on Road Transport Industry in West Germany, UK and USA, September 1960, p. 45.

"...In many units the driver works without a conductor..."Ibid, p. 37. The reference is to Rheinbahn AG (Street Car Association) Dusseldorf, West Germany.

"...Most of the vehicles are one-man operated, which saves the salary of the conductor..." Fifth Avenue Coach Lines Incorporated, New York, Ibid., p. 56.

driver-cum-mechanic² may have to be soon adopted and worked up, because the losses on account of bad and inefficient operation of machines of all sorts are so enormous that any efficiency bonus payable to drivers and operators would be a small part of the losses being incurred. A public bus in India costs Rs. 40 to 50 thousand, but it becomes just a wreck after 2 to 3 years, mainly because of bad driving and lack of attention to maintenance. Practically, every driver is a mechanic, but he does not drive as one conversant with the mechanism of a lorry would drive, because he has no incentive to do so, and we thus lose a capital investment of Rs. 40 to 50 thousand in two-three years. In the UK and West Germany, a bus lasts for more than 10 years³ and is saleable to under-developed countries.⁴ Thus, a very substantial saving is in sight, and a country so short of capital resources and ordinary facilities, and anxious to expand rapidly in matters like bus transport, has necessarily to take action in this respect.

If a bus gets completely depreciated in three years and its original cost is, say, Rs. 30,000—taking both figures on the low side—it works out to a depreciation of Rs. 27/- per day, or about Rs. 800/- per month. A bus driver in India gets a wage ranging between a minimum of about Rs. 75/- to a rough maximum of Rs. 150/-. It is very obvious that no family can subsist on a wage of Rs. 150/- per month. If by good maintenance and cautious driving, the depreciation of Rs. 800/- is brought down to Rs. 400/- per month, it should be practicable and within the limits of economic possibility to raise the bus driver's remuneration to a fair wage level.

It appears inevitable that the economy will either develop along these lines or will be made to do so. It would, of course, be wiser that such a situation should be brought about by mutual understanding and proper co-operation, and not after the bitter experiences of capital waste and inefficiency. Then, sharing the gains of productivity will cease to be a problem.

² "...The Team was particularly struck by the good maintenance of the vehicles of the Company (Schnell Bus Bad Homburg, West Germany). The drivers, being trained mechanics, are responsible for the servicing and maintenance of their vehicles, for which they are paid extra remuneration. This fosters attachment to the vehicle and a team spirit develops. From the productivity point of view the facts about overhaul are really remarkable: an engine runs for 0.4 million kilometers without any major overhaul. Overhauling is usually done once in four years when the engine is changed. Tyres (here the road condition factor comes in) usually run 0.12 million kilometers, when they are retreaded for a further run of 60,000 kilometers..." Ibid., p. 36.

³ "...Another productivity factor that struck us in the working of the British road transport system is its low rate of depreciation...The buses of the London Passenger Transport, for example, are overhauled every four years during which time they may well have done 1,60,000 to 1,80,000 miles. The average age of vehicles is said to be 18 to 20 years...The normal life of a bus in Wilts and Dorset Passenger Service is 15 years..." Ibid., p. 45.
 "...Depreciation is low. Though vehicles are depreciated on a life-cycle of 10-12 years, the company has some buses 22 years old..." Fifth Avenue Coach Lines Incorporated, New York, Ibid., p. 56.

⁴ "... they sell their depreciated vehicles to countries in need. The London Passenger Transport has sold 20-year old vehicles to Yugoslavia and 10-year old vehicles to Ceylon..." Ibid., p. 46.

Sharing The Benefits of Productivity

Higher productivity can provide opportunities for raising general standards of living if its benefits can be shared equitably among capital, labour and consumers. The option between investment and consumption implied by the use of productivity gains for one purpose rather than another is a universal dilemma that has to be faced whether the economy is free or planned. The question of sharing the benefits of productivity presents many difficulties and the following summarised version of an article published in July 1960 issue of the *International Labour Review* analysing the problems involved may be of some interest in India and also remove misgivings, if any still remain.

FEW words have risen to favour quite as quickly as *productivity*. As soon as peace was restored and men could concentrate on economic progress once more, it had such a vogue that its original sense—the ability to produce—was virtually lost sight of, and for the masses, *productivity* became a somewhat hazily understood panacea for achieving the happiness of mankind, materially at least.

Speaking generally, productivity might be defined as the ratio between productive effort and its results. Four problems arise in connection with the measurement of productivity. First, the choice of a suitable unit of time. Secondly, whether one should try to measure the productivity of an isolated unit of production or of all the operations performed in a workshop. Thirdly, the choice of the factor—labour, capital or land—the productivity of which is to be measured. And, finally, it has to be decided what units of measurement of the factors are to be used in the numerator or the denominator. As

for the last, it may be added that the term productivity, when used without qualifications, means the productivity of labour. In other words the denominator is the quantity of labour expended to obtain the output forming the numerator.

The Benefits of Productivity

More Output or More Leisure

Rise in productivity presents, among others, these possibilities: it is possible to obtain higher output with the same effort as before or the same output as before by working less; and one may work a little less and produce a little more, thus taking the benefits of higher productivity partly in the form of goods and partly in the form of leisure.

If it is decided to maintain the productive effort, this may open the way to (a) an increase in the wages paid by the firm; (b) an increase in the other income distributed by the firm (income on capital or entrepreneur's profit); or (c) a reduction in prices.

Quite obviously, these three possible consequences can be combined and in given circumstances they may be encountered either simultaneously or in turn. The most likely course of events is that the three effects will succeed each other in the following sequence.

First, the fall in unit costs and the increase in the volume produced and sold will lead to higher profits for the firm and higher income on capital. Next the firm's prosperity will weaken the entrepreneur's resistance to wage claims, and wage rates will tend to increase or hours of work to fall without a decline in earnings (which amounts to an increase in hourly wage rates). Finally, the technical progress made by the firm will be imitated by similar firms, which, in the normal course of events, will lead to price competition and a tendency for prices to fall.

Although the possible courses in the event of a rise in productivity boil down to two—a reduction in effort and/or an increase in output—theoretical analysis alone cannot decide who will benefit from these different courses. The fact is that in every case there may be four ways of sharing out the benefits of productivity, either immediately or after a lapse of time, namely—(1) an increase in wages (2) an increase in other incomes (3) a reduction in hours of work or (4) a reduction in prices.

The ways in which these four forms combine do not appear to follow any regular pattern, but depend on the economic and social background to the increase in productivity. This background also affects the behaviour of the market (i.e. the customers) and the relative bargaining power of wage earners and employers. The latter in turn are very often influenced by public opinion and the attitude of the authorities, as well as by the purely economic forces of supply and demand.

While, by and large, the greatest share of the benefit from higher productivity goes to wage earners, mainly in the form of higher wages and secondarily in the form of shorter working hours, the other production incomes also receive a share, and consumers likewise benefit through a relative long-term fall in the prices of products affected by technical progress. In other words, while these four forms exist side by side, their relative importance varies considerably from one country and period to another.

Economic Consequences of Different Ways of Sharing

Ways of sharing out the benefits of higher productivity should have the following characteristics:

- (1) they must be fair and acceptable to all the economic agents involved;
- (2) they must not be likely to entail either inflation or a contraction of the economy; **and**
- (3) more generally, they must not compromise the prospects of continued economic growth.

Lower Prices

Theoretically at least, lower prices have a number of major advantages. In the first place they "socialise" the benefits of higher productivity by passing them on to all members of the community, which is perfectly reasonable, since *technical progress does not belong to anybody*.

Secondly, from the standpoint of economic efficiency rather than equity, higher productivity entails a change in the *real* or technical conditions in which the factors of production are used, that is, consumption of these factors per unit produced is less. This means that there is, potentially at least, a fall in costs.

There are also certain disadvantages of lower prices. They add to the burden of indebtedness by increasing the amount of real wealth represented by each monetary unit used for interest or debt payments. They discourage capital-intensive methods and thus weaken the stimulus to the spread of technical progress.

Higher Income for the Employers

Higher income for the employer (profits and income on capital) results automatically if prices do not fall in proportion to the rise in productivity, unless the workers' share in the product is increased. If productive efficiency is to continue to improve, there can be no doubt that in the general interest, the remuneration of capital must be high enough to allow a sufficient rate of formation of new capital. This is particularly important in the case of the economically underdeveloped countries.

Apart from this purely economic consideration, it would normally be difficult, socially, to allow all the benefits of higher productivity to go to the entrepreneurs and capitalists. It is widely felt that social justice requires the workers to receive a large share of the benefits, subject to any limitations imposed by investment needs or (should the economy be under strain) by the risk of inflation. Furthermore, while higher profits, if invested productively, may ultimately be in the interest of the entire community—especially in the under-developed countries, where they may help to create jobs for the unemployed—they may also be ostentatiously squandered on imported luxury goods and thereby worsen the maldistribution of incomes.

Higher Wages

How large the workers' share should be is hard to assess, because provision

also has to be made for the need to keep abreast of technical progress and to improve productive equipment. Any improvements in the latter indirectly benefit the wage earners, not only because of the additional jobs thereby created but also because the future efficiency of labour, which in the last analysis governs the workers' real incomes, will be higher.

But the question which of the workers should share immediately the benefits of increased productivity through higher wages also raises complex problems which go beyond the individual firm and affect the whole national policy. If the gains arising out of higher productivity go only to the workers in the firms or industries in which these gains have actually occurred, the following consequences, other things being equal, will probably ensue:

(1) relative prices will normally remain unchanged since wage costs per unit produced will remain the same if the whole of the productivity gain is passed on to the workers;

(2) the relative demand for different products will also very probably not show any great change unless the *income effect* varies greatly from one product to another;

(3) accordingly relative demand for labour in the industries which have raised their productivity most will tend to fall, whereas the supply of labour to these industries will tend to expand owing to the attraction of high wages.

The result will be a trend towards a distorted labour market and the emergence of an arbitrary, irrational wage structure coupled probably with an inflationary trend caused by the attempts of workers in industries where little or no improvement in productivity has taken place to keep up with the wage increases in the more fortunate industries. In other words the problems will not have been solved satisfactorily.

On the other hand, general participation by the workers in productivity increases at the national level leads to difficulties of another kind which, though different, are nevertheless serious.

In the first place, if wages are to rise at a common rate, this rate must be related to a certain "average" productivity increase, which clearly raises the major difficulty of establishing an index to determine this average; this would involve problems of weighting which would not be easy to solve.

But it can be assumed that a uniform increase in wages throughout industry will result in virtually no change in the supply of labour to different industries, since relative wages will remain the same and accordingly there will be no particular incentive for workers to try to change their jobs. At the same time, since the increase is based on an average figure, there will inevitably be industries in which productivity has not risen as much as the average to which wages are adjusted. In these industries higher wages will inevitably (other things being equal) lead to higher prices and this will normally entail a falling off in the demand for their products. When demand falls, production will have to be adjusted and less labour will be required. As, however, there has been no change in the supply of labour the ultimate result will be a labour surplus in these industries.

Conversely, in the industries where productivity has risen more than the average to which wages are adjusted, there will be a tendency for prices (or at least relative prices) to fall and, therefore, an increase in demand for their products resulting in greater demand for labour without any automatic

adjustment of the labour supply to the new situation.

Shorter Hours of Work

Shorter hours of work in the form of either a shorter working day, a shorter working week, or alternatively of longer holidays with pay, is often one of the aims of the trade unions. If gains in productivity are taken by the workers in the form of increased leisure, the production remains the same and there is no imbalance in the economy. Longer hours spent at home often make people want to smarten up their houses, which leads them to do a number of odd jobs, frequently quite disinterestedly as a hobby. Longer week-ends may lead to expansion in tourist and allied trades. In the short run there will clearly be a probable reduction in the propensity to save, coupled with a rise in the demand in certain trades and a tendency for the economy to expand. In the long run, shorter working hours result in a smaller volume of real wealth than would have been produced if the productive effort had been maintained.

Conclusion

In sharing out the benefits of higher productivity, it is important to keep public opinion, as well as the parties to the debate, adequately informed if sensible decisions are to be reached which make proper allowance for future needs. A balance between equity and efficiency, which must be the aim, can only be struck if even the relatively distant consequences of any particular way of sharing the benefits of higher productivity are perceived and thoroughly analysed, having regard to the special circumstances of each individual case.

* * *

A Tale of Two Factories

R L MITCHELL*

“GO down to the factory” said the Man from the Ministry; “Go there and see for yourself. The management will give you all the help they can. Stay there as long as you like. But please find out what is causing this trouble, and what we ought to do about it.”

The factory was a medium sized one in the public sector, set up about eight years ago in collaboration with a well known British company to make industrial goods urgently needed for India's Five Year Plans, and high hopes were held of it.

And the trouble? Well, it seemed that the Ministry weren't really satisfied with the cost of the goods produced, but still less were they satisfied with the quantity being turned out. The demand for these articles was very great and pressing, and the factory was only supplying a part of the country's needs, so that the rest still had to be imported. Of course, nobody had expected that the new factory would be competitive straightaway, and in the earlier years the low output and high costs had been taken for granted. But it had now been going eight years, and although there had been slight improvements from year to year, its performance was still considered to be well short of the targets set for it.

Some time ago the Ministry had been in touch with the collaborating firm and had obtained details of the production figures regularly being achieved there: output per shift, output per machine,

output per man, and so on. These figures had been compared with those being attained in the Indian factory, and it appeared that on average the new plant's performance was about one-third of that of the British factory. At first it was thought that there must be something wrong with the data, so further checks and further comparisons were made, in much greater detail. And now there was no doubt about it—although in some individual instances the outputs from machines in the Indian factory were as much as eighty or ninety per cent of those in the other plant, overall, the performance was indeed about one-third.

“The managing director says it's the workers,” said the Man from the Ministry; “He says they don't work the way they should. He thinks what is needed is an incentive scheme, then if the workers know they are going to get a bonus they'll come to work on time, work hard throughout the shift, and not take so much time off. But I'm not so sure.”

Well, I wasn't so sure either. Incentive schemes can be very useful aids to management, and good things for the workers too, but they can never *replace* management, and it did sound a bit as though the managing director thought that if he had a scheme, the workers would run the factory for themselves. Anyway, it was no use jumping to conclusions: the only thing was to get down to the factory and take a look.

Now it so happens that I know the factory of the collaborating firm fairly

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well, and thus I was looking forward to being able to make direct comparisons. The British factory is an old one, which has grown up and extended this way and that way, like so many other British plants, so that now it is bursting its seams, and its layout is by no means ideal. The machines, too, are a mixture: some new ones, some not so new, and some still clanking out their last years while they wait for replacements. But still the workmanship is good, and the firm has built up a long-standing reputation in a competitive and quality-conscious market.

The Indian factory was quite different: a brand new building, spacious, set out in plenty of ground, with a well planned layout. Every machine was the latest and best one of its type, properly installed, adequately maintained, and capable of matching the production of the world's best factories. So it obviously wasn't the buildings or the machines that were causing the trouble. Nor was it the materials, for over 95% of the materials used were imported, and were of exactly the same quality—and indeed came from the same suppliers—as those used abroad. Taken all round, the equipment of production was as sound as could be. The trouble must lie with the men in the case: either the workers or the management.

So I spent a lot of time on the shop floor, watching what went on. In the first half hour I thought I knew the answer, and I certainly knew the biggest difference between the two plants, but I wanted to be sure. Over five days I watched each machine carefully, and the operators going about their work, to see whether there was any lack of skill on the part of the operators, pointing to a need for training. Not a bit of it. I soon became convinced that the men had been properly trained, and knew their jobs and their machines as well as anybody else. I saw them when

things went smoothly, and I saw them when things went wrong, and in both cases they knew what to do with their machines and how to sort out the difficulties as they arrived. But although they knew perfectly well what to do, they didn't spend a substantial part of each shift actually doing it. Work was slow to start at the beginning, there were numerous hold-ups for one reason or another during the day, and work ended long before the shift finished.

Now I well remembered the last time I had visited the British plant. I walked onto the shop floor, and within a couple of minutes the foreman of the section where I had entered came up to enquire my business. There was one of these foremen in every shop, and below them charge-hands for each group of six to fourteen workmen. The supervisors had been workmen themselves in earlier years, and had been promoted from the shop floor in most instances. They were in their sections before their shifts started each day, and they remained there most of the day, either on their feet or in their offices which were sited in their sections. If they had to go out of their shops, they left word where they were going. Each of them knew his men and his machines intimately; he knew the shades of skill and dependability among his men; he knew which machines needed nursing; he knew which operations were tricky and needed special handling; he knew where close tolerances and high quality workmanship were important and where they were not so critical. Each was king of his own section, responsible to senior management for getting the materials, drawings, tools and equipment into the section, and the right quantity of the right quality work out of it. When I enquired at eleven o'clock the foreman could tell me how much had been produced in his section upto the tea break that morning, how much the day before, and why last week he fell a little short of target.

Here was the biggest contrast with the Indian factory. I knew there were supervisors for the various sections, because I had examined the payroll before going into the works. But I'd been three days on the shop floor before I actually saw one, and then only because I sought him out to enquire about burnt out bulbs and piles of semi-finished work which had remained unchanged throughout this time. I found the supervisors in an office remote from the shop floor, where they said they had quite a bit of paperwork to do, but were nonetheless ready to receive any worker who cared to come up to discuss his difficulties. For the most part, the supervisors were young engineering graduates, fresh from college, with a more than adequate understanding of the theory and engineering principles associated with the products the factory was making, but no actual experience of making them. There seemed to be quite a high turnover of supervisors, as these young men regarded the job as but a stepping stone to better things, and consequently few of them came to know their workers at all well. When I enquired about output the senior man said he didn't know, but he thought that the figures for the month before last were in a drawer in his desk somewhere.

Down on the shop floor I had seen how the men took their time over getting going at the start of the shift, and how, when they ran out of materials for their machines (which happened in some instances about every half hour) they went off themselves to the stores to get more, there to stand in a queue until the storekeeper managed to sort out the things they needed from the jumbled heaps that were his store. When snags arose the operator sometimes dealt with them himself, sometimes called on his neighbours to down tools and help him, and sometimes sent for the maintenance men or engineers and sat down to await their coming. When work

came off his machine he carried it to the nearest vacant space on the floor and put it down—and there weren't many vacant spaces. It was small wonder indeed that the workers were engaged on productive work for somewhat less than half of the shift, or that they had little compunction about leaving their machines for lengthy chats with their fellows.

No doubt this particular instance was an extreme one, but it is by no means unique. I have seen something of the same sort in any other Indian factory, and particularly (let it be said softly) in factories in the public sector. The foreman or supervisor level of management, the lowest level, the one most directly in touch with production, is frequently neglected, sometimes almost non-existent, and always much weaker than in the factories of the more highly developed industrial countries. And it is this one factor which more than any other is responsible for lower output, higher cost, and generally less satisfactory performance of many industrial units.

Quite recently, in a seminar on Management Accounting held in New Delhi, the working papers for the session on Management Structure included a statement that the foreman or supervisory level is not generally considered in India to be part of management. This I think is probably true: and it is also a great pity, for it points to one of the major management weaknesses in the manufacturing area of industry. When one visits factories and goes through the production departments, as I do frequently, one is often steered gently away from the foremen as being ill-educated fellows, or otherwise of little account in the scheme of things. This I suggest is all wrong: for those who have had experience of managing successful manufacturing enterprises know beyond the possibility of contradiction

that the foremen are indeed a part of the management structure, and a very important part too. Without them the enterprise would not be nearly so successful. Who can run an army without NCOs?

In the older days in Indian industry the jobber carried out many of the functions of the western-style foreman. He knew his men well, he controlled them, and was held responsible by the management in greater or lesser degree for their performance. But the system which relied on jobbers had many pernicious and improper features which outweighed its usefulness in other directions, so that it is now frowned upon, and is, quite rightly, fast disappearing. Unfortunately, getting rid of the jobber has sometimes been a bit like throwing the baby away with the bathwater: the good features have gone with the bad. Now there is all too often a vacuum where there ought to be a supervisor. No senior manager, however competent or enthusiastic he may be, can function as the supervisor should, for if output is to be high and costs low, each smallish group of workers will provide work and

enough for a foreman, and no senior manager can give his men this close attention. Nor will an incentive scheme fill the gap.

It may well be that the concept of the foreman or supervisor as applied in western industries will not fit well into the Indian industrial structure, and should not be grafted without change on to the indigenous management structure. This has been the case in Japan, and in one or two other less developed countries, and these peoples have developed their own ways of ensuring that the essential management functions required of the first line supervision are satisfactorily discharged. Some such development is long overdue in India, for assuredly until a means is found to supply the close attention, assistance and control of workers which is practised in the major industrial countries, and moreover a means which permits the supervisor—or whatever he is called—to deserve and enjoy the respect both of the workers and of top management, production will languish. This is indeed a management problem. It is also one of the Keys to Productivity.



TO A VERY JUNIOR EXECUTIVE

**You've got this simply terrific scheme
You've worked on for weeks, my friend?
You say the plan is as smooth as cream,
As sweet as a dividend?
Will it save the firm a bushel of grief
And a sizeable bale of pelf?
Then son, it's *in* if you solve one brief
Detail: be sure to convince the Chief
He figured it out himself!**

Georgie Starbuck Galbraith



Safety and Productivity

H P DASTUR*

Industrial safety poses the ancient problem of technology as against humanity. But it is not on purely human grounds—these of course are substantial—that the position has been argued here. The real point of the argument is that investment in safety contributes to productivity. Men will not be productive in an environment in which they feel unsafe. The very etymology of productivity is significant: the word is derived from “pro” meaning forward and “ducere” meaning to lead or to draw. Productivity is thus a matter of leading people forward and drawing the best out of them and this cannot be done unless safety precautions are taken in their interest. In fact, the problem necessitates a change in the whole perspective of industry. Modern industry in order to succeed has to invest much more in men than in machines.

THE early pioneers saw easy money in applying to industry the new discoveries of physics and chemistry, but the mistake they made was that they saw no need also to consider man: his anatomy, physiology and psychology. The employee was given no status save that of an economic unit. His safety and growth were considered his own concern.¹

This, however, soon proved to be an untenable position, as the change over from manual labour to mechanical power created hazards of a new and extraordinary character. The development of electric power greatly increased these hazards. The production of atomic energy has now created radioactive dangers of a type and magnitude never dreamt of in the history of mankind.

Even normally, the progress of industrialisation has multiplied hazards

by contact with chemical poisons, dangerous machinery and hazardous manufacturing processes; and these hazards specially those affecting the health and sometimes even the life of human beings have to be treated as a class by themselves, as men cannot be put in the same category as machines and materials. It has, therefore, been accepted as an obligation of industry to provide for the safety of persons working in industrial concerns. But it is not only a question of law; for law alone cannot make men safe or productive.

American business leaders² cite five fundamentals of human nature as broad drives which profoundly influence conduct. They consider *sense of security* as one of them. Obviously an adequate safety programme will satisfy the employee's sense of security and thus contribute materially to his productivity.

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¹“...It is a historical fact that the very elementary precautions for ensuring safety of human life in mines and factories had to be enforced by law...” Lokanathan, Dr P S, *The Fundamentals of Productivity, PRODUCTIVITY*, Volume 1 No. 3, page 9.

²*Human Relations in Modern Business*, Prentice Hall Inc. New York, 1950.

it can just be taken for granted that in industrial installations where safety is nobody's concern, productivity is bound to be low. But neither safety nor productivity (and there is never one without the other) is a ready made packet to be bought and sold. According to Elton Mayo this is a human problem to be brought to a human solution through human data and tools. The art of managing is simultaneous development of machine and man so that the instinct of self-preservation can be converted into an attitude of cooperation instead of conflict. And that would spell less accidents and higher production. When however management fails to develop and maintain *a safety sense throughout the factory*, human relations suffer, and susceptible employees become *accident-prone*, which is foreign to man's instinct of self-preservation and is an imposed effect of mismanagement through poor working conditions and through lack of understanding of human nature.

It is by now obvious that an uncontrolled technology can be ruinous to mankind. Man's uneven struggle with machine has reached a stage where something radical needs to be done. It is not merely enough to issue a caution to sail safe through unsafe conditions by avoiding unsafe attitudes. Like practically anything else, safety requires a regular training programme that should bring home to each employee a knowledge of his limitations and how to remain continuously safe despite those limitations. By its very nature, such a safety programme has to be a continuous process, with repetition for constant correction; for human nature is forgetful and distraction makes him more so, there being no lack of distractions in industry.

Secondly, it is essential to bring the working environment of each employee

within the limit of his adaptive forces. This demands a safe and clean workplace and that is management's responsibility. It is here essential to record that mere monetary incentives are not a substitute for a programme of what may be called constructive safety. Further, such a programme makes it possible for management to show its concern in its employees. It can, therefore, contribute in its own way to the improvement of production, quality and cost performance. A safety programme is an integral part of supervision and a cornerstone of good employee relations, hence, also of productivity.

Apart from these high considerations, safety awareness must be considered an essential and integral part of modern life, for the machine culture has come to stay. As it is machine that makes modern life more productive than it was at any time, we have to accommodate ourselves to the demands of this machine culture. We must, therefore, make adequate safeguards for industrial safety with due consideration for the anatomy and physiology of the men and women who have to work the machines. Safety education has to be a regular part of industrial training. It is however, not only the top and middle management who have to shoulder the responsibility of building and maintaining safety in the industrial structure but safety awareness has to be created among the work-people.

Safety performance to be effective must be based on four elements. They are, according to Dereamer³ (1) development of safe working conditions (2) creation of safe work habits on a personalised basis (3) promotion of employee participation in safety, and (4) corrective action when safety rules are ignored.

The worker and the supervisor are, of course, vitally concerned, but the

³DEREAMER, RUSSELL, *Modern Safety Practices* —Chapman & Hall Ltd., London, England, 1958.

management has to provide the funds and appoint the personnel for an effective safety programme to take active and continuous interest in it and drive it home to every member of the production line that safety means business. Safety requirements have to be kept in mind when scheduling, routing and planning production. By no means, however, is the production department alone responsible for safety. There is no department in a modern factory which has not a useful part to play in the cause of safety.

The responsibility for safety of the engineering department is high and second only to that of the production manager and his line supervisors. In fact the latter are very often unable to do anything unless full cooperation comes from the engineering department which is responsible for designing of processes, of machines, and of fixtures; of planning, arranging and guarding them to remove the possibilities of mishaps. It can also help the production department by undertaking safety analysis of time-setting standards, wage incentives or output quotas.

The next in importance is the maintenance department. If not safety-minded it can create temporary hazards of its own by obstructing traffic aisles, throwing scrap around, not blocking off dangerous areas, leaving live electric wires exposed, undertaking welding in wrong places and so on. On the positive side it can serve safety through proper lubrication, alignment, and adjustment of equipment; through periodic inspection of tools and timely repair or replacement of the worn out parts; and through general plant housekeeping and yard and ground maintenance.

The purchasing department too can play an important part. It can do much to help safety by insisting, when purchasing new machines and other equip-

ment, that they include all necessary safety guards and features.

Thus everybody is concerned with safety. Even the employee, round whom the safety programme revolves, can and should contribute, for it is in his self-interest. Accident compensation is poor recompense for loss of earning capacity. But productivity is so dependent on safety awareness that a department of safety engineering solely and specifically in charge of developing and running a safety programme, becomes a *sine qua non* of a factory whose employees number about two thousand. This number may have to be reduced to as much as five hundred in chemical or steel factories where hazards are more. And as safety is an intimate part of health, the safety engineering and the medical departments have to do teamwork. In fact the training of the safety engineer and the industrial physician includes several common subjects. They are 1. environmental hygiene and occupational diseases, 2. mental hygiene and industrial psychology, 3. safety engineering, 4. industrial toxicology, and 5. statistics.

The responsibility, however, must be squarely on the safety engineering department, whose functions may be elaborated in the words of Dereamer (i) teach, counsel and advise, assist line management to fulfil its responsibility for safety (ii) provide for periodic safety appraisals, to pinpoint unsafe work environments and unsafe practices and processes and make recommendations for correction (iii) promote and maintain a continuing safety-education programme which will help create safety awareness at all levels, but especially at that of the first-line supervisor (iv) maintain and interpret accident and injury statistics and accident-cost data (v) devise measurements and set standards which provide for an adequate evaluation of accident-prevention performance and loss control for each

supervisor at each level of management (vi) provide for the advancement and dissemination of fundamental safety knowledge, conduct safety research and put existing safety information into usable forms such as safety booklets, data sheets, instruction manuals and bulletins (vii) maintain liaison with national, state, and local safety councils and take an active part in the activities of such groups.

Having established that industrial safety is an operational need, besides a moral gain, and having fixed its responsibility, its techniques may now be considered. They vary according to the nature of hazards.

Slowly but surely, industrial management is realising, that to get anywhere at all, the above-named concept of industrial safety must be integrated in the man-machine system of modern industry. *To do so, equipment, work space and work environments must be adapted to human use.* The functioning, however, of a safety engineering department, will be effective only if a start is made at the blue-print stage of machine design programme of an establishment, for *built-in safety is most effective and most likely to evoke the necessary and steady support and co-operation of employees for further safety work.* When, however, hazards which could have been controlled at the blue-print stage appear in the production field, management may find it too difficult and too expensive to deal with them. Built-in safety is good economy and good human relations, and therefore one of the roads to higher productivity.

If such closely welded man-machine system is to pay dividends, machine designs and factory layouts should pay due attention to human tolerance, and not

overstep its limits. Before putting machines into motion, engineers test them for tensile stress and elastic force, and then lay down limits for their speed or load. Safety, of course, demands that it be so, but it also demands something more. The maximum output of a machine is not its maximum work potential, but what its operator makes of it. Whether the watchword is safety or production, to give of its best, the machine's speed and load should be so tuned as to remain within limits of human tolerance.

To quote Hatch, "some of the work-imposed stresses which fall within the scope of human engineering have rather clearly defined health implications even if they do not cause frank illness. Improper dimensional relationships between the work and his task, awkward body position, prolonged repetitive use of a few muscles, poor visual relationships, excessive noise, vibration, heat are some examples frequently seen in industry. . . . There is an undoubted relationship between the accident potential of the job and the goodness of adjustment between man and machine".

The trend of industrialisation is towards automation and an increasing use of radio-active substances. They harbour hazards of every kind: physical, physiological and psychological. But the psychological stress they can cause is highest among the known industrial hazards, for "the peculiar qualities of radiation are that it is invisible, unheard, unsmelt, untasted and unfelt, apparently infinitely powerful, yet springing from an almost infinitely small source, and—as far as the individual is concerned—uncontrollable." The danger, made doubly so by irrational fears, is so great that engineers

*HATCH, THEODER, Proceedings of the 12th International Conference on Occupational Health. Helsinki, Finland, 1957.

•World Health Organisation—Mental Health Aspects of the Peaceful Uses of Atomic Energy—Technical Report Series No. 131, Palais Des Nations, Geneva, 1958.

realize that built-in safety is a necessity when using radio-active substances.

A built-in safety programme must be based on research study of men and machines. According to McCormick⁶ "Human beings appear to surpass existing machines in their ability to: (1) detect small amounts of light or sound (2) receive and organise patterns of light or sound (3) improvise and use flexible procedures (4) store large amounts of information for long periods and recall relevant facts at the appropriate time (5) reason inductively (6) exercise judgment (7) develop concepts and create methods.

Existing machines appear to surpass human beings in their ability to (1) respond quickly to control signals (2) apply great force smoothly and precisely (3) perform repetitive routine tasks (4) store information briefly and then erase it completely (5) perform rapid computations (6) perform many different functions simultaneously."

What needs stressing is that both built-in safety and maximum production depend on correct division of work between man and machine so as to *take full advantage of human abilities and counteract human failings*. When however engineers are taught only *machine techniques* without any reference to their effects on human beings, they *consider safety as anybody's business except their own*. Training of engineers, therefore, needs reorientation from being production-centred, as it is, to what it should be, if the system is to be fully productive: employee-centred. Old-timers would find such conversion difficult; because *safety was not a part of their undergraduate training* and because no one ever breathed to them a single word about it during their induction to their first industrial task. It is

the author's experience that such supervisors make poor comrades in the routine course of safety work, though through no fault of their own. To remedy this the author started *inducting every new entrant among supervisors through the safety department* in order to give him a clear idea how safety can help him to advance his own interests by improving his leadership and, through it, his production. As this answered, the old timers were also given in batches similar induction. This too answered which suggests that it is a *communication problem*, and one of the principles of built-in safety is to communicate approaching danger through signals of light or sound or taste or smell or colour at the right time and in the right place.

It must be said that *technicians are giving increasing attention to built-in safety*. Yet when it comes to the consideration of human factors they direct their attention to the requirements of man without considering woman. Modern industry is made by and for man, but woman is invading industry in increasing numbers, for the two world wars have proved that there are few industrial tasks which she cannot do with credit, but her anatomy, physiology, and needs of safety are appreciably different from those of man.

The author in his paper on "The impact of Industrialisation on woman"⁷ has noted that some of the special features of woman's anatomy are that she has more fat and less muscle, shorter limbs, less height, shorter thumb and larger index finger than man. Those of her physiology are menstruation, pregnancy and menopause, while psychologically she has superior social intelligence than man and is more emotional. Some of these peculiarities work to her advantage in relation to man and some

⁶MCCORMICK, ERNEST J, Human Engineering, McGraw-Hill Book Co., USA, 1957.

⁷DASTUR, H P, The Impact of Industrialisation on Woman—Background Paper for the All-India Women's Conference, 1958.

to her disadvantage, but they all demand recognition, if woman is to play a useful part in industry without harming herself, industry or society. To ask her to use machine controls, workbenches and tools made suitable for man, not to make allowance for her stressful physiological conditions, or to laugh at her emotional status as so much sentimental nonsense that can have no play in a matter of fact business outlook, is to neglect an important phase of human engineering.

Industrial safety has three important sides: health hazards, accidents and fires. Each of them is important enough for individual attention. To consider health hazards first, they are of four types: physical, chemical, biological and psychological. Appendix I gives a workable picture of the main industrial hazards. Any technique for detection of hazards to be effective must be systematic. All the present and probable hazards may be noted by checking upon all the likely sources of the various types of hazards. Such sources are the layout of the room surveyed and its upkeep, its ventilation, illumination and traffic lines, machines therein and tools and equipments used on them, its raw materials and their processing, by-products, finished products, industrial wastes and anything else likely to lodge a hazard. If such a survey reveals that in any room poisonous chemicals are used in some number, a further toxicological survey of that room is made. If it is suspected that any risk does actually exist, further confirmation is necessary through medical examination of the exposed employees in order to determine the nature and extent of damage done. Only after collecting such factual data can one take suitable preventive measures.

The main principle of preventive measures for these three types of hazards mostly revolves round engineering revision of their sources. Some

methods of such revision in common use are: (1) substituting a less harmful agent in place of a harmful one (2) enclosure of a hazardous process (3) its isolation (4) removing poisonous dusts and fumes through exhaust system (5) using a wetting process for dusts which cannot be exhausted (6) limiting employee exposure to hazard. When none of these is possible the last resource is protective clothing. But here too engineering revision is necessary for its use in tropical countries. Most of what is available is suitable for use in a cold climate but not in a tropical one. Research in this line is overdue.

The above measures however cannot prove enough for radiation hazards as they work, as already stated, in the dark. Extra precautions are necessary and some of them are *remote-handling equipment*, shielding materials, use of monitoring devices to gauge the amount of rays absorbed, storage under effective supervision, and *education of employees*, especially to relieve them from the heavy psychological stress of an unknown danger like that of radiation. While the development of nuclear power shows how far we have advanced in technology it is rather unfortunate to have to record that industrial management still goes by the old argument: "no production—no job—no safety." They little know that a safe plant is ordinarily an efficient plant, as may be illustrated from a real story of World War II.

During World War II, Government was urgently in need of some processed material for their ordnance factories. They wanted to place the order with the most efficient factory among the several that were producing it. Government asked an expert to visit all such factories and recommend the most efficient. He had however no time to visit them, but the Government wanted the report very urgently. So he asked each such factory to send him its accident records

of last three years, and he selected the one which showed the best safety performance. Later on when he visited all these factories and saw things for himself he found that his choice was correct.

Simonds and Crimaldi⁶ report that the American Engineering Council, through its committee on safety and production, carried out an extensive study to try to determine the relationship between safety and productive efficiency. They included nearly 14000 companies. They concluded that highest efficiency and best accident records generally went together. And naturally so, for both are products of the same means, like careful planning and control, attention to methods, suitable equipment, and proper training and supervision of the employees.

Though the slogan "no production—no job—no safety" is catchy and sounds business-like, it is yet far from facts and without substance. If those who believe in it were to analyse accident costs, they would find that the slogan in tune with actual facts, and one likely to lead to better business, should be "no safety—heavy costs—less production".

According to Heinrich the ratio of uninsured to that of insured costs of accidents is 4:1. This has recently been questioned by Simonds and Grimaldi on the ground that the ratio method is keyed too much to single averages and ratios. They further argue that frequency is a much more valuable indicator of safety performance than severity, for blind chance has more play with severity than frequency. So they have devised a new standard method whose basic principle is expressed in the following formula:

Total Cost = Insurance costs + A times number of cases of (a) perma-

nent partial disabilities and (b) temporary total disabilities + B times number of temporary partial disabilities + C times number of cases of minor injuries requiring only first aid + D times number of no-injury accidents.

In the formula, A, B, C and D are constants indicating respectively the average uninsured cost for each of the categories of the cases. To determine these averages one must analyse each of the four types of accidents for their factors of uninsured costs, and some of the important ones common to all types are: (1) cost of lost time of injured employee (2) cost of time lost by other employees who stop work (3) cost of time lost by foremen, supervisors or other executives (4) cost of first-aid not paid by the insurance carrier (5) cost due to damage to machines, tools or other property or spoilage of material (6) cost of weakened morale due to the accident.

Apart from mere calculations, steps should be taken to gather facts that may enable management to devise proper remedies for preventing accidents. Accidents are caused. They do not just happen. So the natural starting point has to be investigation of causes. The two most important factors of accident causes are (1) unsafe acts of employees and (2) unsafe conditions of work. The general sources of these two factors are tabulated in appendix II.

The purpose of investigation of accidents is to gather facts that can help in the prevention of accidents, and not to allocate blame. For this, all accidents must be investigated, no matter whether the resulting injury is major or minor or nil. In fact, investigation of accidents which have caused only a minor injury may give clue which can help preventing serious injuries in future from the same type of accident. And the right time of investigation is as soon after the

⁶SIMONDS AND CRIMALDI, Safety Management, Accident Cost and Control, Richard D Irwin, Inc., Homewood, Illinois, 1956.

accident as possible. Delay may remove or destroy evidence or one may even forget details.

The next question is who should undertake such an investigation. Obviously the two officers most suitable are the supervisor and the safety engineer. The supervisor is on the ground and so is likely to know more of actual working conditions in his department and his employees' attitude towards them. But the safety engineer has experience and wider knowledge of the subject. So he should be there to help the supervisor. Later on, it may also prove necessary for members of the safety committee to have a say.

Merely collecting facts is not enough. If they are to prove useful they must be analysed by causes, by location, by nature of injury and part of body affected and so on. Such analysis reveals trends which help in deciding what particular remedy should be applied for prevention of a particular type of accident. According to Heinrich, there are four basic remedies:—

- “1. Engineering revision: including the guarding of machines and tools, isolation of hazards, revision of procedures and processes, illumination, ventilation, colour and colour contrast, provision of personal protective devices, substitution of safer tools, etc., replacement and repair, and a wider variety of similar steps of a mechanical or physical nature.
2. Instruction, persuasion and appeal: including training as well as instruction and re-instruction, persuasion and appeal through the motivating characteristics of persons (shop psychology), visual as well as oral approaches, safety education and safety organi-

sation with all of its many activities.

3. Personnel adjustment: including selection and placement with regard to the requirements of the job and the physical and mental suitability of the worker, medical treatment and advice.
4. Discipline: including mild admonishment, expression of disappointment, insistence, statement of past record, transfer to other work and penalties.”

This brings up the question as to who should apply corrective action. Engineering revision has to be the responsibility of top management. They must decide whether a particular revision should be done by the supervisor, safety engineer, mechanical department, or outside contractor.

Regarding the second remedy, mass appeal through formal safety talks and safety manuals, and through slogans, posters, films, contests, and the rest of it, has a place in safety education, particularly in maintaining safety awareness, if not creating it. But considering that in eighty per cent of accidents human failure is one of the causes, informal man to man on-the-job training becomes necessary. Each worker has his own unique group of failings, and each has to be taught specific work habits to meet the needs of specific hazards of his job. This means that safety education, to be useful, should include both positive and negative aspects. It should not stop short at merely showing the right way of doing a job safely, but should also draw attention to the wrong methods and the harm they can do. Only the supervisor can deal adequately with such training, for he knows much more than any one else of the good and bad points of each of his workers and of the working conditions of his department.

However to enable the supervisor to take kindly to personalised job safety training, it should be made clear to him what there is in it for him. It can pay him high dividends by way of being accepted as a leader, and by increasing his production and lowering its costs.

However, a genuine difficulty faces the supervisor, even when he is ready to try out on-the-job safety training. The number of general safety details is legion, and he is not making an idle excuse when he asks where he is going to find time for them all. But this is not necessary. The problem is to make each employee safety-conscious and keep him there constantly. For this he needs a few guides which he can use to evaluate each situation for its potentials of accidents and which can lead him to adopt in good time measures that can prevent the potentials from becoming actual accidents. This is a matter of laying stress on a few key-points of safety, and repeating them over and over again till their use becomes a habit. According to Dereamer, the main key-points are:—

1. Make a habit to pause a moment to size up the situation before acting.
2. Always assume that the situation may have changed.
3. Make a habit to evaluate personal feelings, undue mental stresses, and weakened physical condition in terms of possible causes of accidents.
4. Avoid the point of no return. Always be prepared for the unexpected.
5. Look for a second line of defence."

The third remedy is personal adjustment, that is, matching work to worker. This requires a preliminary job analysis to determine the demands a particular job is likely to make on its workers. This has to be a joint effort of the per-

sonnel, safety and medical departments. Here too the supervisor is in an unique position to help this team because ordinarily he is more likely than any one else to know the accident potentials of jobs under his direction.

Follow-up work is necessary to determine whether placement and induction are leading him towards safety awareness. Such work depends on communication. Safety education seeks to develop socially desirable attitudes, but they depend on satisfaction of basic human needs. Safety communication is not merely a mechanical process of conveying information to the worker about accidents and known methods of preventing them. It has to be a living process of changing each employee's attitudes. The road to such change lies through respect for human needs, through man-to-man understanding of such needs and of ways and means of satisfying them. The spoken or written word means little to an employee unless it reaches him through his needs of a sense of belonging, of gaining recognition, of participating, of acquiring knowledge. *Eighty per cent of accidents are due to human failure through inattention, lack of interest, worry, and impulsiveness.* Safety communication is necessary to correct such faulty attitudes.

The fourth remedy is discipline. The three "E"s of safety are engineering, education and enforcement. When education fails, enforcement must follow. But education is sure to fail unless two conditions are first satisfied. Its message must be meaningful for each employee. To be so, it must be personalised, for each employee is an individual and not a type. Secondly, only when engineering revision has had full play, can the message of education go home. No amount of education can tempt an employee to use a machine guard that hinders his production or wear a goggle that does not fit him.

So far we have touched upon five main steps of an accident prevention campaign: (1) organisation (2) fact finding (3) analysis (4) selection of remedy and (5) application of remedy. But it is remarkable how blind routine often leads to complacency and final failure. To prevent such a result, periodic appraisal of the effectiveness of an accident-prevention campaign is necessary. Two yardsticks in common use for this purpose are (1) frequency rate of accidents and (2) severity rate.

To complete the study of industrial accidents, the problem of industrial fires may now be considered. Appendix III gives their main causes and sources. Their prevention and control depend on the same general principles necessary for prevention and control of industrial hazards and accidents. But when they fail, two remedial measures are available. They are (1) maintenance of a fire-fighting squad and (2) maintenance of specific fire extinguishers for specific types of fire. The fire-fighting squad has to be kept in training through periodic drills for ensuring efficiency in the use of fire-fighting equipment. Factory watchmen should also receive this training, as they, especially night watchman, are the first to notice a starting fire. Water is widely used as an effective extinguishing medium for most fires. Water however is unsuitable and even hazardous where electric equipment or inflammable liquids are involved, or where damage caused by water is likely to prove excessive. The equipment necessary for control of a fire is of two types: automatic and portable. Many types of apparatus have been developed. The best example of an automatic device is the water sprinkler. Appendix IV gives types of portable extinguishers in general use. All extinguishing methods are based on one or more of the following three principles:—

1. Eliminate oxygen from air.

2. Remove fuel supply.
3. Reduce temperature below ignition point.

To sum up, safety seeks to protect men, machines and materials,—the three pillars on which rests the main foundation of industry. Safety protects men against accidents and ill-health, machines against inefficient handling and materials against damage. It is evident that safety should be ingrained in the productive system. This means that each industrial unit must have of course according to its size and character a personalised safety programme functioning as a preventive and educative service. The principle objective of such a constructive programme is prevention of damage to life and limb and property, while its other side is increased production of both man and machine. Mere good intentions cannot fulfil it. It needs active support and cooperation of all the interested parties viz., Government, industry, labour and the professions concerned. Such support can, however, flow only when safety is accepted as an operational need. This calls for education. Compulsion, at best can only have second place. Moreover, safety is teamwork, and to ensure the right type of team spirit in its activities, continuous educative propaganda is a must.

It is the humble claim of the author, who has spent a whole life time in industry as medical adviser, that the type of safety programme elaborated above will go far towards counteracting the baneful effects of the present dichotomy in industry and contribute in a not insignificant measure to making industry a single homogenous process of growth by replacing fear with hope, ignorance with understanding and aggressiveness with cooperation.

APPENDIX I

INDUSTRIAL HAZARDS

Classification by types

- I Physical**
- 1 Inadequate illumination
 - 2 Inadequate ventilation
 - 3 Unguarded machines, faulty tools or equipment, bad housekeeping
 - 4 Abnormal heat
 - 5 Undue noise
 - 6 Undue vibrations or wrong posture
 - 7 Abnormalities of air-pressure
 - (a) Compressed air
 - (b) Rarefied air
- II Chemical**
- 1 Poisonous metals and chemicals, liquid or solid
 - 2 Dusts :—
 - (a) Organic like cotton, pollen, coal
 - (b) Inorganic of poisonous metals and chemicals
 - (c) Inert like marble, limestone
 - 3 Gases and fume of organic solvents, of inorganic gases and those emanating from liquids or solids, or heated metals
- III Biological**
- Bacteria, fungi, sepsis
- IV Psychological**
- 1 Maladjustment to work or work environment
 - 2 Disturbed inter relationship between
 - (a) employee and his co-workers
 - (b) employee and his supervisor

Reactions to health

- I Physical**
- 1 Eye-strain, fatigue, injuries
 - 2 Aggravation of community diseases
 - 3 Injuries through accidents
 - 4 Heat stroke, heat exhaustion, cramps
 - 5 Deafness
 - 6 Strain on muscles, tendone or nerves
 - 7 (a) Rapture of lung alveoli
(b) Heart disease
- II Chemical**
- 1 Skin irritation, burns, systemic effect
 - 2 (a) and (b) Skin irritation, metal fume fever, lung diseases, toxic systemic effects
(c) Irritation of skin and upper respiratory passages, oxygen deficiencies, affections of nervous system, toxic system effects
- III Biological**
- Bacterial infection and skin diseases
- IV Psychological**
- 1 and 2: Psychosomatic diseases, neuroses, accident proneness

APPENDIX II

ACCIDENT INVESTIGATION BY THE SAFETY ENGINEER

UNSAFE WORKING CONDITION (ENVIRONMENTAL)

- 1 Improperly guarded agencies, e.g. unguarded moving parts
- 2 Defective agencies—like damaged tool or equipment or faulty design of machines
- 3 Bad housekeeping
- 4 Improper illumination
- 5 Improper ventilation and temperature
- 6 Unsafe dress or apparel
- 7 Any other cause

UNSAFE ACTS (PERSONAL)

- 1 Ignorance of hazard
- 2 Lack of sufficient skill to work the safe way,
- 3 Physical deficiency for the job
- 4 Wrong attitudes
 - (a) Absent-mindedness
 - (b) Overconfidence
 - (c) Haste
 - (d) Impatience
 - (e) Laziness
 - (f) Lack of interest in the job
 - (g) Bad temperament
 - (h) Temptation to take chances and show off
 - (i) Fatalistic attitude

APPENDIX III

THE MAIN CAUSES AND SOURCES OF INDUSTRIAL FIRES*

- 1 Open flames, high temperatures, stoves, furnaces, salamanders, welding and cutting, lamps, heated pipes and surfaces, matches, smoking
- 2 Friction. Hot bearings, belts, cutting, grinding
- 3 Electricity, Defective wiring, arcs, sparks, heat resistance, static electricity.
- 4 Chemical reactions. Spontaneous ignition, reagents, acids, oxidizing agents

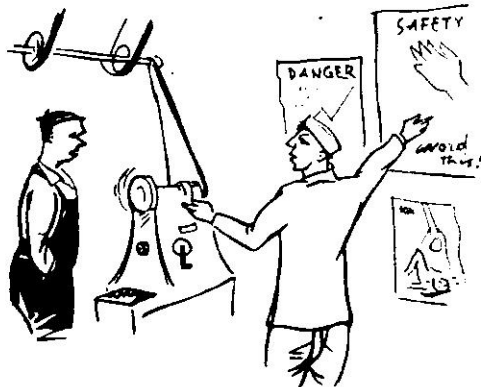
(*Abstract from the *National Safety News*, March 1958.)

APPENDIX IV

TYPES OF PORTABLE EXTINGUISHERS IN GENERAL USE*

- 1 Anti-freeze
- 2 Carbon dioxide
- 3 Dry chemical
- 4 Foam
- 5 Pump tank
- 6 Soda and acid
- 7 Vapourizing liquid
- 8 Water-filled (gas cartridge or air pressure)
- 9 Water pails.

*(Source: *National Safety News*, March 1958.)



We just put up posters !

Worker Productivity and Outside-Plant Life

K SREENIVASAN*

Many social scientists as well as managements have found that a satisfied worker is also a productive worker. In this context 'satisfaction' refers not so much to economic satisfaction, but rather to personal, social and emotional satisfaction. When a worker is worried and anxious either because of personal problems or because of his relationship with his co-workers or the community, his work performance suffers. This is only to be expected since life cannot be compartmentalised into working life and domestic or social life. The satisfaction he derives from work has an influence on his life outside and *vice-versa*.

MAN is a social being; his feelings and attitudes are conditioned to a large extent by his past experience and his present environment. There are very few people in the world who are completely immune to their environment or are in a position to change it to suit their needs. The vast majority of mankind have to work out some sort of compromise between their individual needs and the situation in which they find themselves; and in that process of compromise, they are more or less happy depending on how successful that compromise has been from the individual point of view. Therefore, by providing a better environment for the fulfilment of the worker's social and intellectual needs, it is possible to make him a happier and more contented individual, and also a more productive worker.

While a number of investigations on similar problems have been under-

taken in Europe and America, they are not particularly relevant to our own country, because the sociological conditions are so vastly different. But they all emphasise the need to provide better environment to industrial workers. Unfortunately we have not come across any studies in our own country and we would suggest that here is a fruitful field of research for our sociologists to undertake.

A group to study the problem was formed consisting of representatives of management, trade unions, government nominees and social workers interested in industrial labour. It was thus a composite group which brought to bear on the problem, considerable amount of practical experience of worker's life and his problems. This article is based on studies made by the group in the Coimbatore district.

While the personal problems of the worker have been kept in view, this study is mainly concerned with the sociological and cultural problems of

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workers as a whole. Though the primary interest of SITRA is in the textile industry, some non-textile organisations were also included partly to get a general picture of workers' life after working hours and partly to find out any special problems that the textile workers have.

The guided questionnaire method was adopted for the study. A questionnaire was prepared by the Group and administered to management, supervisory staff and workers of six textile and four non-textile organisations. The organisations were selected in such a manner that from the point of view of employee services they represented a fair average for the industry in Coimbatore. While the managements and supervisory staff were interviewed by the members of the group, the workers belonging to these organisations were interviewed by the staff of SITRA. In all, 27 members of management and 200 workers were interviewed. Interviews were also sought from some trade union representatives and social workers working in industrial areas.

It was found that one non-textile and two textile factories have provided employee services in a planned and organised manner. In the non-textile factory, about 50% of the workers have been provided with free quarters. There is also a social club open to all members of the staff as well as workers. The activities in the club include outdoor as well as indoor games, swimming pool, gymnasium, a cinema house and a reading room and library. A subscription of Rs 4/- per annum is charged to the workers while the staff subscription is based on salary. The total number of workers taking part in various activities daily seems to be about 200 which is 15% of the total number employed. The workers and members of the staff mix freely in the club with no social distinction whatsoever. The club is run by a committee consisting of equal number

of workers and staff presided over by the manager.

The management have also provided a hospital, a family planning centre and a middle school for the workers' children. Workers take part in organising dramas and excursions. A volunteer corps to keep watch over the quarters at night as well as a St John Ambulance Brigade have also been organised. For those workers who want to take up hobbies such as gardening and poultry keeping, free seeds and eggs are distributed by the management.

The management are of the view that workers' life after working hours has a profound influence on their work as well as their own feeling of importance and have set about to improve it systematically. They claim that workers living in the quarters provided and taking part in the various social and cultural activities are, generally speaking, better workers and better citizens. They as well as their womenfolk are better dressed, more cooperative in the factory and mix freely with the officers without any selfconsciousness. But management feels that they have not been as successful as they ought to have been, because of the distractions offered by the nearby town.

Of the textile mills, one has constructed about 180 houses for their workers and have provided many amenities there, such as recreation facilities, cooperative stores etc. The other mill has provided about 100 houses for their workers. Recreation facilities have been organised in a systematic manner in another textile unit and workers seem to make full use of the facilities offered. A gymnasium has been organised and a library and reading room have been provided. Books for the library are purchased in consultation with workers and nearly 20% of the workers are using the library and reading room.

Besides, annual games and sports are held and annual sightseeing trips are organised. The management are of the view that workers who participate in all these activities are more regular and efficient in their work.

In the other factories included in the study, though occasional picnics and dramas have been arranged, no employee services can be said to exist.

Two of the unions out of three have provided reading rooms and libraries. They are also organising cooperative housing societies and are expecting to construct colonies in the near future.

Generally speaking, there was broad agreement between the views expressed by all people with regard to the manner in which workers spend their time after working hours. Most people were also agreed that workers' life after working hours affected their performance on the job. Many managements gave sleeplessness, family worries and doing an extra job in their spare time as causes of inefficiency of some of the workers. But, when it comes to the details of a worker's life, many managements are not in a position to give precise information. In this case, the interview with workers is to be relied upon as being first hand. The summary of interviews with workers is presented below.

Generally speaking, urban workers seem to take to recreational activities more than rural workers. The opportunities for recreation are perhaps greater in urban areas. As was to be expected, men spent considerably more time in recreation than women and educated workers more time than uneducated workers. The time spent on recreation also seems to increase with increase in earnings. Under recreation were included reading, listening to the radio, taking part in or watching games and sports, going to the cinema, clubs etc.

Of these, going to the cinema seems to be the most popular—we might almost say universal—form of recreation. About half the number of workers frequented pictures between two and four times a month. About 92% of all workers interviewed said that they went to pictures atleast once in two months. Contrary to expectations, 95% of the rural workers frequented pictures as compared with 90% in urban areas. There was no significant difference in the percentages of textile and non-textile workers, men and women workers. In the case of single workers the percentage was 99 against 90 for married workers. But there was a gradual decrease in attendance as the age of the workers increased, being only 34% for workers above 51 years of age. There was also a marked reduction in the case of workers whose monthly income was more than Rs 120/- (highest income group). It is probable that workers drawing higher wages are also older and hence the reduction.

With regard to the amount of money spent on pictures, about 50% of the workers seem to spend between three to four rupees per month while the others spend more. This expenditure includes any tiffin or meals before and after going to pictures and conveyance charges. About 10% of the workers said that they spent as high as Rs 15 per month on this recreation. The rural workers seem to spend slightly less than urban workers; and so also women workers less than men workers, though their frequency of attendance is about the same. This may be due to the fact that perhaps, the charges are lower in rural areas and women workers go to lower class seats than men workers. Generally speaking, the expenditure on picture going is in conformity with the frequency of attendance.

Only about 10% of the workers interviewed took part in games and

sports activities. Football, hockey, badminton, volley ball and Indian games such as *15 dogs and three tigers*, *chadu gudu*, *silambam* and *tiger dance* are more popular among rural workers while cards and carrom and gymnasium seem to be more popular among urban workers. Open fields and grounds are more easily available in rural areas and it is easier to organise field games in those areas. Further, the rural workers who were interviewed happened to come from community development block areas and the government has made provision for these games. A very small percentage of women workers said, they played games like *pallankuzhi* and *thayakattam*.

While cards and gambling were completely absent among rural workers, about 2% of the urban workers admitted that they gambled. One of the union representatives stated that a few recreation clubs have been started in some industrial areas which were only places for gambling. This is an unhealthy tendency and reflects the need to provide workers with more useful forms of recreation.

We tried to ascertain during these interviews the extent of domestic help rendered by men workers to their families. Majority of workers render some help in running the household. There is no difference in this respect between rural and urban workers. But single workers render less help than married workers. The extent of help rendered increases with the age of the worker except in the case of the last age group, that is, over 51 years. The extent of domestic help rendered decreases as the level of education and the level of income increases.

Of the types of help rendered, buying provisions seems to be most common. The next in importance is fetching water. While more urban workers undertake this work—probably because

of the scarcity of water in urban areas—very few of them help in cooking. On the other hand, about 10% of the rural workers said that they helped in cooking. Looking after the children is also one method by which help is rendered and this is very common among older workers. Other duties like cleaning the house, washing clothes etc., are not common among men workers. Where the family had any cattle, milking and tending seem to be the work of men. A greater percentage of textile workers seem to help their families than non-textile workers.

While a majority of workers said that they spent their time with their families or co-workers, rural workers seem to spend more time with their families than urban workers. As the level of education increases the workers seem to prefer the company of co-workers and friends rather than the family. This is also confirmed by the frequency of visits paid to relatives. It would be rash to conclude from this that education weakens family ties, but it does indicate a tendency that should not be overlooked. The workers with increased income also seem to spend less time with families. However, visiting relatives seem to be more common among them than with lower income workers.

While a major portion of the spare time of the workers is spent in the house, a large portion of the remainder is spent with co-workers or friends in public places near tea shops, betelnut shops, tailor shops, barber shops etc., which seem to act as centres of social intercourse where workers meet and chat with their friends and co-workers.

There was a small group of workers who said that they preferred to be alone rather than in the company of other people. This was also confirmed by a union representative. One of the reasons for this seems to be a fear on the part of these workers that by going out and

mixing with others, they might get into bad company and waste a lot of money. It may also be that these workers have not been able to integrate themselves into their social group or it may be that they are introverts by nature. It has not been possible for the group to go into this problem during this study.

About 8% of the workers interviewed make use of a reading room or library. There is not much difference in the reading habit as between rural and urban or textile and non-textile workers. But, as is to be expected, men read more than women and younger workers more than the older workers. The reading habit also seems to be more common among workers with higher incomes. The thirst for knowledge and information among workers is obvious from the fact that a large number of illiterate workers have newspapers read out to them by their literate friends. The types of books read are mostly novels.

About 5% of the workers had gardening as a hobby. Other hobbies mentioned by workers include tailoring, beekeeping, collecting autographs, astrology, *sidha* medicine, homeopathy and karagam dance etc., but the number in each category is very small. A few workers were also interested in cultural activities such as playing musical instruments, taking part in *bhajans* and dramas and occasionally listening to religious discourses. Practice of hobbies was also found to be on the increase with higher levels of education.

It is difficult in many cases to distinguish between a hobby and a subsidiary occupation. When an activity is undertaken primarily with the object of receiving additional income and not for the pleasure it affords, that activity has been classified as a subsidiary occupation.

Nearly 20% of the workers seem to derive some income from one source or other. Owning lands seems to be the

most common, accounting for nearly 10% of the total number of workers. The next in importance is income from house rent which accounts for another 3%. These may be considered sources of additional income and not as subsidiary occupations, as in most cases, the lands are leased out or cultivated by other members of the family. As is to be expected, a greater percentage (28%) of high income workers own land as compared with the other groups (7%). Other sources of income include owning small shops (3%), tending cattle and selling milk (3%), selling vegetables (1%), charka spinning (1%), poultry keeping (1%) etc. Money lending and taking spare time jobs also seem to be additional sources of income, but their percentage is very small. Income from these spare time jobs varies from a maximum of Rs 100/- per month to a minimum of Rs 4/- per month with an average of Rs 30/- per month.

We are also informed that a few work as temporary workers in other mills during weekly or annual holidays in order to earn extra money. This is not desirable from the point of view of the health and well-being of the worker and we hope that steps will be taken to prevent it.

The weekly holiday is generally utilised by a majority of the men for discharging family duties and obligations and for taking rest. But a majority of women workers utilise the weekly holidays for going to pictures. The annual leave is taken by a large number of workers in case of sickness to themselves or to some other member of the family. An equal number use the annual leave for performing important family functions such as marriages. During annual leave, workers go out for sightseeing and pilgrimage to distant places. The percentage of workers who take part in this activity is very small. However this habit is on the increase. This is a welcome trend.

While most of the workers are members in one trade union or other, only about 5% of the workers visit union offices once a week and take an active part in union affairs. A greater percentage of urban workers seem to take an active part in union affairs and the age group 30—40 seems to be most active.

Not many workers are active members of political parties and even when they are active, it is only through their respective unions. In the industrial areas some workers are members of panchayat boards; in fact some panchayat boards are managed by members of unions. The number of workers who are members of other organisations is very small.

From a brief review of workers' life after working hours given above, it is obvious that by and large, no attempts have been made to provide useful forms of recreation to workers as a whole. Going to the pictures is at present the only form of recreation available to them. While this may help them to forget their worries and to enjoy themselves to a certain extent, when it is indulged in too frequently, it is merely habit forming and can be a drain on the workers' financial resources.

From the replies given by some of the managements, it is obvious that workers living in reasonably comfortable quarters have a much better standard of life than those who live in overcrowded and unhealthy areas. This has also been confirmed by another study undertaken by SITRA in Madras when it was found that workers living in good quarters had a greater sense of responsibility and standard of moral values than those who shifted from place to place or lived in slums. If the basic necessities such as ventilation and light are not available in their homes, then the workers prefer to spend their time in places where such facilities are available. Most

shops provide good illumination, music from a loud speaker and a congenial atmosphere; and in the absence of other places of recreation, the workers gravitate to these places.

The provision of housing in industrial areas is totally inadequate. The group are of the view that managements, government and the local authorities should do everything in their power to provide good housing estates at low rent.

The amount of time spent by workers—both men and women—in procuring such an elementary necessity as water has been found to be surprisingly large. While this reflects the acute scarcity of water in this area, the group are of the view that provision of a good and adequate water supply is of prime importance in improving workers' life. Lack of suitable parks and playing fields in industrial areas has also been brought to our notice by one of the union representatives. Many of the industrial areas which were rural are fast becoming urbanised and densely built up. It is necessary that steps should be taken to provide these amenities before they become even more overcrowded and no land becomes available for such purposes. Water supply and provision of communal amenities are areas where government will have to come to the aid of the local authority.

While the small number of people making use of libraries and reading rooms reflects the low standard of literacy among the workers, we are of the view that there is a thirst for knowledge among many of the illiterate workers, as seen by their keenness to have the newspapers read out to them. Starting of adult education classes should satisfy this need.

As far as the employers are concerned, it is essential that besides housing, they should provide a maximum number of employee services. The number and type of services would naturally de-

pend upon the size of the factory, its location etc. But in providing these services, the management's decision should primarily be based on the following broad considerations:

1. The services should be provided as desired by their workers. They should be carefully selected on the basis of the needs and requirements of the workers and in consultation with them. Very often, it happens that workers do not show a great deal of enthusiasm for types of recreation to which they are not accustomed. It then becomes the responsibility of the welfare officer not only to start and operate these services, but to create an enthusiasm for them also.

2. The services provided should be purely in the nature of services and no return should be expected of them. The origin of employee services has its roots in paternalism and they are therefore often suspected by the workers. Hence it should be made perfectly clear that there are no strings attached to these services.

3. While the initiative for starting and maintaining these services may come from the managements, the running of these services should be left as far as possible to workers' representatives.

If the above points are borne in mind in providing employee services in factories, we are of the view that they would not only be fully utilised, but will ultimately benefit the workers as well as the larger interests of the industry as a whole.

Other suggestions that were made during discussions within the group include the introduction of thrift schemes, family planning and the construction of permanent buildings which can be used by workers for celebrating weddings etc. Construction of holiday and convalescent homes was another

suggestion that found favour with the group. There is a provision in the employees state insurance scheme for such purpose and we hope it will soon be undertaken. It is also understood that the Madras Government have, for their consideration, a bill to constitute a Labour Welfare Fund. This is a step in the right direction.

It has also been noticed that in the past, unions have been concerned exclusively with getting better conditions in factories for workers and have not devoted sufficient attention to the problem of industrial welfare. We are of the view that the role of the unions should also include measures taken for the improvement of workers' life after working hours. Such interest will also help to mould workers into a homogenous group even more than what the managements could do.

Some of the questions that arose during discussions were (1) Whether recreational facilities should be provided near the place of work or near the places of residence (2) Whether each factory should provide their own employee services or whether such services should be provided jointly by a group of factories in the area and (3) Whether these should be made available to workers only or to the industrial community in general.

The group could give no readymade answers to these questions. If the workers of a factory lived over a wide area, it is obviously not possible to provide facilities near their houses. On the other hand if all the workers—or a majority of them—lived in a housing estate or quarters provided by the factory, it would probably be better to provide facilities for recreation near the quarters. Again, a small factory cannot be expected to provide all the various types of recreation that their workers may desire. In such a case it may be better for some of the factories in one

area to provide them jointly. Though a majority of the workers said that they preferred the company of co-workers, a sizeable minority said they preferred to spend their time with their friends. Providing recreational centres for the industrial community as a whole would make workers participate in recreation along with their friends and not restrict them to co-workers only. We are of the view that the answers to these questions depend on the circumstances in each area and no definite rules can be laid down. In any case, considerable thought and discussion should take place before deciding these problems for a particular area.

While the problems of the worker as an individual were not studied by the group, nevertheless, we are of the view that counselling and guidance should be one of the services in any comprehensive scheme of industrial welfare. Very often, the personal problems of the worker far outweigh in importance his other needs and a solution of these could contribute considerably to his well being. This is particularly true of workers who have migrated newly from agricultural to industrial jobs and find integration into a new society, difficult.

Looking at the problem of workers' life after working hours as a whole, what has struck the group most forcibly is the fact that the subject has evoked so little interest in the past in industrial and sociological circles. Industrial labour welfare is still in its initial stages of development in our country and a number of studies under various circumstances and areas has to be undertaken before we can answer some of these

questions that arise in our minds. Such studies obviously have to be undertaken with the cooperation and if possible, the active participation of management and workers' representatives.

We would therefore suggest the formation of an Industrial Welfare Society on the lines of the Industrial Welfare Society of Great Britain. It should be a voluntary organisation in which, management, workers' representatives and social workers and Government should come together and work for the common objective of improving workers' life after working hours. They should undertake study, research and training, advise management on the introduction of welfare measures and undertake counselling and guidance.

As far as Coimbatore is concerned, we understand that the Gandhi Memorial Fund is contemplating the setting up of such an Institute. We welcome this idea, but would suggest that both labour representatives and managements should be associated with its organisation from its inception so that they may bring to bear on the problem their practical knowledge of the needs and requirements of the workers. Such cooperation and participation by these two groups in constructive activity will stand them in good stead when they have to cooperate in other industrial problems.

In conclusion, we would like to express our very firm view that there is probably nothing equivalent, for raising industrial productivity to attention paid to the improvement of workers' life outside the time spent in the factory.

* * *

**What is feared of senior management, is not its
lack of good intentions, but its distance.**

Prof A N Whitehead

NPC

THE most outstanding event in the recent history of the *npc* was the Productivity Seminar held at Vigyan Bhawan on 7-8 October, 1960: outstanding because the *npc* emerged as practically the arbitral body possessing the necessary technical competence for determining the elements that enter into Productivity and the criteria for distributing its gains. More important than this, the parties which normally differ so widely in political and economic affairs, accepted without question the *npc* as an organisation which enjoyed their undivided confidence. The charter of *npc* was accepted as not only a common ground for agreement but as the basis of the socio-economic policies that affect Industrial Productivity. NPC has to capitalize on these substantial gains, which emerged from only the first session of the Seminar. The second session of the Seminar has to be prepared for; the basic agreements reached have to be given a concrete shape and organisational arrangements made for experiments at the plant level: experiments in achieving actual productivity increases, and also experiments in the equitable sharing of the gains of productivity.

The basis for discussion was furnished by Dr Lokanathan's paper on 'Sharing the Gains of Productivity', reproduced on page 3 of this Journal. The *npc* secretariat circulated a number of papers on the respective roles of management, workers and government in achieving higher levels of productivity and a comprehensive paper on Sharing its Gains. Invitees to the Seminar were also furnished with background material: a study made by the working

group of the Belgium Productivity Centre on sharing the gains of productivity, report of the seminar held on the same subject at The Hague etc. In order to focus attention on concrete measures and guiding principles for general agreement, draft recommendations were prepared on (i) measures which government, employers and workers may take for attaining the goal of higher productivity and on (ii) the basic principles that would determine the Sharing of the Gains of Productivity. Following general principles were enunciated and broad agreements arrived at in the Seminar.

Sharing the Gains of Productivity

- I The principle of sharing the gains of increased productivity, embodied as one of the agreed principles in the charter of *npc* was re-affirmed. The gains of higher productivity should not accrue to only one party and must be shared.
- II A number of factors (technical, human, environmental, including machines and materials) contribute to the increase of productivity. Improvements in machinery, techniques, methods, skills and management operations all contribute to the increase. It is obviously difficult to attribute specific increases of productivity to specific factors, in isolation from the others.
- III It was agreed that the gains of productivity should be shared between:
 - (a) the community, by way of lower prices, increase in the variety and quality of goods, increased yields from taxation and savings for development

- projects, and welfare measures;
- (b) the investors, in increased returns and opportunities for expansion and re-investment; and
- (c) the workers, in higher wages, shorter working hours, improved working conditions and increased employment opportunities.

IV Principles of sharing the gains should take into account that:

- (a) the determination of shares should be fair and acceptable to all the economic agents involved in the productivity processes;
- (b) the effect of sharing should not materially contribute to the inflation or contraction of the economy;
- (c) there should not be reduction of the prospect of rapid and continuing growth of the national economy; and
- (d) the recipients of the gains should be prepared for sharing the sacrifices in order to share the gains on agreed and fair basis.

V In the method of distributing the gains of productivity, consideration should be given to the fact that there is a gap between the current wage level and the need-based minimum and that there is need to fill this gap. Where the current wage is above the need-based minimum, but below the fair wage, there will be need to reach the fair wage to the extent possible. These general considerations will require to be appropriately viewed in their applicability to small or un-economic units which may not be fully able to meet these demands.

VI There is considerable scope for the use of incentive schemes as a means of giving direct reward to the workers responsible for specific increases in productivity. Piece rates and time rates both have their merits and drawbacks, and it is necessary that

incentive schemes take account of all the practicalities and are based on scientifically determined data and procedures. Incentive schemes, if improperly handled, can possibly lead to exploitation of workers, and it is therefore desirable that trade union officials should become acquainted with technicalities of incentive schemes so that they can adequately safeguard the workers' interests.

VII Whatever criteria and principles are adopted for sharing the gains, the determination of shares will essentially have to be done on the broad principles evolved by *npc* and the Indian Labour Conference, and in mutual consultation with experts and parties concerned. In the final distribution the issues could be settled through the known processes of collective bargaining. It is necessary to maintain and strengthen collective bargaining procedures and to employ them in obtaining implementation of the principles which have been enunciated. Implementation may have to be on plant to plant basis, with individual agreements between employers and workers.

VIII Social aspects of the problem of sharing the gains cannot be ignored. It is necessary to keep in view that

- (a) higher productivity should not result in or add to unemployment or lead to demotion or loss of earnings;
- (b) productivity processes should not lead to any undue intensification of the work load; and
- (c) the productivity drive should not undermine the growth and development of trade union organisation.

IX It is very important that trade unions should be encouraged and assisted to develop sufficient *expertise* to ensure that they are able to evaluate and appreciate productivity proposals, and to determine what schemes of sharing

the gains would be most satisfactory to them.

X It is the declared objective of the Five Year Plans to maintain the price level and curb price increases. This would ensure that the benefits of higher productivity to the workers are not nullified.

XI Measurement of increase of productivity and determination of the shares of gains will need technical appraisal. It was decided that an Expert Committee to be set up by the npc should examine the methods and principles which should govern the distribution of productivity gains.

The Committee should bear in mind:

- (a) the experience gained in this field in India and other countries;
- (b) the need to provide a rapid rate of growth of the economy;
- (c) the effect of sharing the gains of industrial productivity on the lower-paid workers outside organised industry;
- (d) the special difficulties of small factories;
- (e) as a large number of factors affect productivity, it may be necessary to determine specific as well as overall indices;
- (f) the need of ploughing back productivity gains to secure expansion;
- (g) the paramount necessity of maintaining the price line;
- (h) the necessity of evolving practical methods applicable during the next five years, and in any case not more than 10 years;
- (i) the urgency of raising the standard of living of the workers.

Against the background of these requirements the Expert Committee should consider the various principles and methods of distributing the gains and recommend those which should be adopted in the context of the conditions prevailing in Indian industries and which can be envisaged in the future upto the maximum of ten years.

Cooperation for Higher Productivity

For ensuring cooperation of all the interests involved in the productivity drive, the Seminar re-affirmed the principles embodied in the charter of npc. In particular it was recognised that the agreement on the principle of sharing the gains of productivity was a pre-requisite for securing the full cooperation of all the parties for increasing productivity. For attaining this goal it was agreed that the following measures should be adopted by government, employers, workers, and the npc:

I *Government* should re-orient and streamline, with a vigorous productivity bias, the organisational set-up and procedures of its organs dealing with matters of industrial development.

II *Government* should take positive measures to ensure that the public sector enterprises develop into models of administration for demonstrating productivity techniques and the benefits flowing from their introduction.

III *Government* should consider ways and means of incorporating the essential fundamentals of productivity subjects in the curricula of technical studies.

IV *Government* and employers should make a positive declaration that no worker will be thrown out of employment merely on account of the introduction of productivity processes and that any worker rendered redundant in a section or a plant will be absorbed within the enterprise or the industry without loss of earning or status.

V *Government*, employers and workers should bring about conditions for the maximum utilisation of installed capacity by enabling the running, wherever possible, of three shifts.

VI *Employers* must recognise the workers as entitled to the fullest consideration in their own right and not

merely for the sake of production results. They should continuously strive to improve the working conditions, environment and welfare measures, for bringing about conditions which would enable the workers to give of their best.

- VII *Employers* must make positive efforts to generate an atmosphere of mutual trust and cooperation, and take initiative and positive action to dispel doubts and fears, where they lurk, among workers in regard to productivity. The workers must be assured that the drive of productivity does not involve undue intensification of their effort nor greater speed-up. They must also be assured that they will receive their due share of the gains, appropriately determined resulting from increase of productivity.
- VIII *Employers* in consultation with the workers should establish an effective machinery for communication and joint consultation, so that the workers are correctly informed with regard to management's objectives and policies. Their doubts and questions are properly answered, their constructive suggestions are duly entertained and acted upon; and they are taken into confidence in every project involving changes for improvement.
- IX *Employers* should organise training programmes for all levels in their enterprise: top management, senior and junior executive, technicians, supervisors and workers. An intensive programme of induction and instruction should be introduced for development of proper attitudes of workers towards productivity.
- X *Employers* should consider ways and means of introducing incentive schemes in their enterprises. They should also consider the scope and feasibility of introducing suggestion schemes for encouraging workers to put forth suggestions for effecting improvements.
- XI *Workers* must make a positive effort in the generation of a proper atmosphere of mutual trust and cooperation wherein the employers are persuaded to shed whatever doubts they entertain in regard to the full participation of workers in the productivity drive.
- XII *Workers* should actively associate themselves with the efforts to set up joint consultative machinery in the enterprises and should in cooperation with the management, ensure successful functioning of the machinery.
- XIII *Workers* should provide an appropriate machinery within their organisations for motivating their ranks towards productivity and to keep them correctly informed with regard to productivity developments. An appropriate atmosphere should be generated by them in and through their organisations for whole-hearted participation of the workers in the productivity drive.
- XIV *Workers* with the help of government and employers, where necessary, should aim at building up specialists and research workers in their organisations for objectively evaluating productivity proposals emanating from managements, and for actively participating in the processing of productivity techniques and procedures while safeguarding the rights of workers.
- XV *Workers* should ensure maximum participation in the programme of workers' education and should seek expansion of such facilities.
- XVI *The National Productivity Council*, representative of government, employers and workers, should continue developing the programmes of dissemination of information and knowledge about productivity techniques, organising training programmes for all levels in industrial enterprises, and stimulating technical exchange in the industries. Specific measures



Sri Manubhai Shah awarding certificates to successful candidates in work study, Kanpur



Dr PS Lokanathan inaugurating a course at Madras on tool engineering and manufacturing, conducted by Mr Kenneth C Jasper, TCM expert



Dr PS Lokanathan visiting Atlas Cycle Industries on the occasion of Productivity Seminar held at Sonepat



TCM Productivity experts visiting Enfields, Madras

should be taken to bring about the introduction of productivity techniques and practical application of above requirements in selected enterprises. The Council should help employers and workers in assessing the gains of productivity.

The drafts reproduced above are being examined by a technical committee, which will report to the next session to be held sometime at the invitees' convenience. For reasons of space, reference has not been made here to the important policy speeches made at the Seminar by the Ministers of Labour and Industry and the Chairman of the National Productivity Council. These are being processed for reproduction in pamphlet form to be published shortly.

... ..

In the field of productivity training, *npc* has practically covered the whole country (industrial areas) in respect of courses in work study. At present there is concentration of this type of work in northern, central and western India, West Bengal having been already covered. By January 1961, *npc* officers will also cover the South. The management training programme is being pursued with vigour under the leadership of O Keller. In addition the marketing management programme which started earlier at Dalmianagar in September is being greatly expanded with the arrival of a TCM expert G Barnewall. Large new areas in tool engineering and manufacturing are being covered by a very competent team under the leadership of Omar L DeWitt. Besides, a number of other courses have been started or are scheduled at a number of places: quality control at Madurai, Sonapat, Dandeli etc; methods study at Coimbatore and Bombay; stock and inventory control at Tiruchirapalli; production planning and control at Jamshedpur, Madras etc; personnel management at Bangalore and Bombay; cost and budgetary control in Assam; job safety course at Dalmianagar

etc. This, however, is not a complete account. A fuller account is given in the *npc* Information Bulletin, which gives details of the programmes of LPCs and a larger number of other organisations and institutions which are coming up to help the productivity drive.

In-country teams for the study of industrial productivity, which earlier formed small part of the *npc* programme, is now coming up on some scale. The team on industrial relations constituted by Madras Productivity Council has gone round the industrial units in Calcutta, Jamshedpur, Chittaranjan and Darjeeling. The team of incentives organised by the Mysore State Productivity Council has visited several units in Madras. The Kerala Productivity Council has planned a team on small industries; and the Faridabad Productivity Council proposes to constitute one, on human relations in industry. The Circuit on industrial engineering, organised jointly by the Bombay Productivity Council and the Institute of Industrial Engineers has started functioning; as also the Madras Productivity Council Circuit on work study.

The expansion of foreign aid programme has been of an order that practically every month some teams are going and others returning from the study of various aspects of industrial productivity in the principal developed countries in Western Europe, the USA and Japan. Four teams on packaging, stores and inventory control, supervisory personnel and foundries left in September 1960. Three more teams on incentives, marketing and distribution, and materials handling are scheduled to go shortly. On the other hand, five teams on industrial safety, industrial maintenance, sugar, plant layout and cost accounting have returned in recent months.

The programme has now been extended to cover the Soviet Union; and it is now firmly settled that five teams will

be going this year to the Soviet Union to study certain specific industries such as iron and steel, cement etc. NPC is negotiating with the Government of Czechoslovakia to enable these teams to cover that country also.

The foreign programme of productivity training is gathering momentum. 20 trainees left in September 1960, 16 trainees having already left under the TCM programme. Shortly, this figure will come to 46. In this sphere also, the Soviet Union has offered to help by way of 6 months' training to 25 candidates in the field of mining, chemical, mechanical, electrical and metallurgical engineering, textiles, optical glass etc. This training programme may be extended to Czechoslovakia.

The npc has also a follow-up programme: the trainees who have come back from France (as also those who had gone under the TCM programme) are meeting in a conference under npc auspices towards the end of October 1960 in order to discuss how best to utilize the advanced training that they have received.

In the field of advisory service, npc officers visited nearly 50 establishments in September 1960, offering advice on a large variety of subjects: work study, production planning and control, tooling and manufacturing, quality control, absenteeism etc.

There has also been a considerable expansion of information activities. Team reports on road transport and plastics have been published, and on the whole well received. The report on cotton textiles will be published shortly, and two other reports on building layout and cost accounting are being processed for publication.

Film shows are being organised practi-

cally all over the country as part of a large scale routine programme. Recently, the places covered were Calcutta, Asansol, Jamshedpur, Bangalore, Madras, Ahmedabad, Bhavnagar etc. Library facilities of npc are being extended to LPCs, both in respect of regular productivity literature, as also periodicals which the npc is receiving through the good offices of TCM and otherwise.

... ..

NPC is sponsoring an ILO Management Development Project in November and December, 1960. This includes (i) an advanced management programme of four weeks for senior executives to be held at Bangalore from 15 November to 9 December, and (ii) a five-day conference of industrial leaders to be held in New Delhi from 12 to 16 December.

The prime minister will inaugurate the conference of industrial leaders and the finance minister will address the closing session on the future of private enterprise in India's mixed economy. The conference will consider five subjects, namely (i) supply and control of materials, both Indian and foreign (ii) equipping industry: economic considerations in purchasing plant and machinery (iii) opportunities for growth and development in public and private sectors (iv) management and the worker, and (v) developing to-morrow's manager.

... ..

Considering all the npc activities against the general background of social change and industrial expansion, there appears to be a reasonable prospect of the productivity movement acquiring a national character; and npc is determined to play its part in lifting the economy to a higher level of productivity and wellbeing.





Irish Industrialisation and Productivity

D A HEGARTY*

I doubt if Irish Industrialisation has really been tried as yet, that is, tried under suitable conditions. Elementary geography teaches that an industry be established in a locality because of access to raw materials, power, transport or markets. We are in danger of thinking of these physical factors as paramount and of resigning ourselves to an artificial economy in which we would achieve a measure of industrialisation based on high protection and our own limited home market: an outlook and policy that could end only in economic stagnation. We have been very slow to realise that these physical factors are not, in fact, the most important ones, that success in industry depends much more on the human factors, that is, outlook, character, skill and organisation, and that it is in these matters that we have been most seriously deficient. If we can make them good, we can achieve far more in the industrial field than we have ever dreamt of.

BEFORE considering how higher industrial productivity can be achieved, one may ask why we should try to develop industry, instead of concentrating on agriculture. The question has been debated as if these were alternatives. The only answer is to develop both because they are complementary: the one needs the other. Increased agricultural production, if accompanied by successful marketing, will make us better off, but to succeed, it must be based on mechanisation and that means less employment. During the past twenty years gross agricultural output has risen by about 11%, while agricultural employment has fallen by about 25%. Agriculture alone therefore cannot solve our unemployment problem.

The successful development of industry not only means employment for those, who cannot find it on the land,

but it means creating a greater home market. This would help in the development of an export market which will furnish us with the means to provide a higher standard of living, and without these two—more opportunities for employment and a higher living standard, emigration is inevitable; so we must aim at a mixed agricultural and industrial economy.

Unemployment has had a serious effect on our economy: an effect out of all proportion to the apparent numbers. The fear of it has induced workers to adopt, in self-defence, policies designed to spread the available work thinly over groups of the population so as to give as many as possible a living. This has resulted in serious under-employment of our resources of human skill and labour. It can be observed in restrictive practices, casual labour and the excessive numbers engaged in the retail trade. It

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represents an immense waste of our manpower. One of our problems is to find the means to redeploy these lost man-hours into productive enterprise.

We could do this if we could develop the export market, but unemployment induces restrictive practices and these practices prevent us from making full use of our resources so as to develop the export market and thereby eliminate unemployment. We are, in fact, caught in a vicious circle. So also were the other European countries until their management and labour got sense enough to come together and recognise that the problem could only be solved by joint action. They succeeded. We have yet to do so and now for the first time Irish management and labour have a chance to plan together the break through. But it means that our industrial enterprise must take on a new form to enable it to compete in the export market and to achieve low living costs at home.

Unemployment has also had an unhealthy influence on our protection policy. A protection policy is necessary to foster industry, especially in a small State such as ours and it has, in fact, achieved much, but it has its dangers. It makes it possible (though this extreme is not true of Irish industry generally) for the inefficient to *bungle* into industry without experience or skill: to make serious errors in planning which damn the industry from the start, to be incapable of managing it efficiently, but having created employment and a vested interest, to look for government assistance or a higher tariff to make up for the deficiencies, thus adding to our costs of living and of production. That is not the kind of industry, or the kind of industrialist to build up our economy, and while this was perhaps an inevitable phase, it cannot continue without grave damage to the country because we need export industries and these will not grow in such a soft and enervating

industrial climate. What then is the answer?

In this country we have been too insular and so we have largely missed the benefit of a *new industrial thinking*, which has blossomed in Europe since the War and which has resulted in unparalleled prosperity, which so many European countries enjoy to-day.

This new thinking centres around the word *Productivity*. It was the Americans who discovered the importance of a scientific approach to management and production. When after the War they took the great decision to participate actively in the reconstruction of Western European economy by means of Marshall Aid, they wisely resolved that the provision of money was not enough and that Western European countries should be enabled to benefit from the progress which American has made in the sciences of management and production. They brought to Europe more than money and new techniques; they brought also a new outlook and it is that perhaps, more than anything, which has influenced the extraordinary change which has taken place in the Western European economy since the War.

The first change to be effected was in the outlook of the employer and worker towards each other. The exploitation of the worker in the 19th century had been countered by the creation of the trade union movement, but the situation which emerged was one of mutual suspicion and conflict, the employer being anxious to get as much work, and the worker to give as little, as each could get away with. Both attitudes were based on long standing prejudices not easily amenable to reason. Before any progress could be made, therefore, it was essential to convince both parties that *however they might differ as regards the division of the cake, they were only cutting their own throats by failing to cooperate in baking as large and*

as saleable a cake as possible. In these countries the process of re-educating management and labour has now made considerable progress, a new outlook has been created and many new techniques in industrial relations have been developed. There are very few workers, who do not now agree that their best interests are served by the maximum productivity and very few managements who do not accept the necessity for consultation with the worker and for mutual understanding on the introduction of new techniques.

Considerable importance is now attached to training at all levels of industry, but especially at the management level. Managers are chosen for high personal qualities, experience and training. New techniques in management and production are being developed and are being made available to them continuously. Much impetus has also been given to scientific and technical research, as well as to production techniques, and effective means are available for the dissemination of this information and its introduction into practice. One of the more important discoveries has been that managers and others, who are charged with the task of maintaining the flow of work, are so much engrossed with that task that they have no time to plan the most economical way of doing the work. Recognition of this has led to the development of a new kind of expert or specialist, whose activities are devoted exclusively to the planning of work and to research in the development of new techniques. They work in close consultation with managers and employees in introducing these new techniques into industry.

All this is designed to achieve increased productivity, which is not to be confused with increased production. It means increasing the ratio of input to output, or using better organisation and methods to produce at less cost, whether that cost is expressed in money or in

physical or mental health. Producing more at less cost means selling more because your goods are more competitive and thus it means increasing the rewards of the employers and workers who produce and market the goods as well as raising the standard of living of the people generally.

Increased productivity does not mean that the ordinary worker has just to work harder; on the contrary, it is frequently achieved by reducing to a minimum manual labour and irksome or irritating work conditions. It means using better methods to produce the commodity at lower cost, but these methods must apply throughout the firm: to buildings, plant layout, work processes, transport, distribution, marketing etc. Employers and workers must work as a team, each fully conscious of the benefit that is to be derived from such cooperation and the employees must be just as keen as the employer on such matters as satisfying the customer, reducing costs, eliminating waste, contributing suggestions, promoting team work, maintaining quality and output and giving value for money.

One can explain productivity in simple terms, but it is by no means a simple operation. It involves a considerable and continuous operation in the individual firm, carefully drawn government tax policies and the creation of certain ancillary community services, for example, advisory services, credit schemes, marketing, etc. It is, in fact, a combined community effort which has a common purpose and of which there is a common understanding.

For this purpose, the Irish National Productivity Committee has been established. It is a very important development for this country as through it Irish Industry will now have access to the vast fund of management production, scientific and technical skills, accumulated throughout Europe since the War

These will be readily available and Irish management and labour will be working together so as to make the best use of them. This is possible because of the existence of European Productivity Agency, which is responsible for the dissemination of new ideas and techniques in Europe and is associated with the organisation for European Economic Cooperation (OEEC).

The aim of EPA is to create a new outlook, forward-looking and with a readiness to examine new ideas and new techniques and, while preserving the separate roles of management and labour, to bring them together to achieve the common purpose of baking as large a cake as possible, to stimulate research in science and techniques of management and production and to make these results available to the member countries and to act as a pool for the exchange of information on these subjects: and to do all this not as an academic exercise of interest to scholars, but in such a way as to achieve the immense practical results which can now be seen throughout Europe.

EPA is served by a very experienced and able staff, and it has also available to it American and European experts, who are engaged on temporary assignment for the conduct of research in new techniques and for their dissemination to industry in the various countries.

EPA works through national productivity centres, established in each country. The Irish National Productivity Committee, which is the Irish Centre, was established in 1959. It consists of representatives of the chief employer organisations and an equal number of representatives from the now United Irish Trades Union Movement. The Committee is also representative of the universities and of the technical schools and of the Institute of Industrial Research and Standards.

The Committee began by holding at Red Island, Skerries, in September, 1959, the first Joint Management/Labour Conference to be held in this country, so as to emphasise the need for increased productivity, a view which both management and labour accepted at the conclusion of the Conference. This was followed by a joint Management/Labour Seminar at which leading Dutch Experts indicated the means which might be adopted to increase productivity in a particular firm. An Irish industrialist and an Irish trade unionist also contributed to the discussion. This seminar evoked considerable interest.

Besides the Committee, there is the Irish Management Institute, which has had, in its short existence, a profound influence on management outlook and training and this influence is rapidly spreading. It has already made good use of EPA services and should, in future, be in a position to do so to a much greater extent. It has stimulated similar activity in other trade and professional organisations. The Federation of Irish Industries, the Federation of Trade Associations, and the Federated Union of Employers, are also represented on the Committee.

The Productivity Committee, moreover, is very fortunate in that its advent coincides with unity in the Irish Trades Union Movement. The Irish Congress of Trade Unions has already set up a committee to deal with this question of education and training in the trade union movement and arrangements have already been made for EPA assistance for this purpose.

In recent years, in association with EPA very important research work is being done by psychologists, scientists, doctors and other experts to ascertain the avoidable factors which produce physical and mental strain, fatigue, frustration and danger to life and health in industrial work. Their elimination

increases productivity. A joint committee has been formed under the chairmanship of the Reverend Dr O'Doberty, University College, Dublin, to study this work so as to introduce the benefits into Irish industry.

A promising development in EPA services is their decision to organise and finance joint management-labour missions from a particular industry to study the progress made in other countries. The Irish National Productivity Committee has already approved the sending of a joint management and labour team from the Irish cement industry to examine the progress made in other countries.

The Labour representatives, at the Red Island Conference and at the recent seminar, raised the question which is obviously uppermost in the mind of any working man in the approach to productivity: "If I cooperate in increasing efficiency, am I going to work myself out of a job and what will happen if I am redundant?" It is a fair question and the success of a productivity drive will depend largely on the efforts which management and the community make to be sincere and constructive in their approach to it. Mr Vermeulen, who was formerly a very distinguished Dutch trade union leader, and now head of the trade union section of EPA dealt with this question of redundancy at the Dublin joint seminar. Unless we, in Ireland, are prepared to make a united community effort to increase our productivity, we might have to face a degree of unemployment and economic hardship far more serious than such minor local and merely temporary redundancy, which might result from the adoption of mechanisation, new methods and techniques. He indicated various methods which had been worked out for dealing with temporary redundancy under productivity programmes such as retaining all existing employees and cutting down on recruitment, moving

redundant employees to other work, government schemes for redeployment and retraining of labour, and employment benefit schemes to cover any temporary period.

In fact it is the efficient firms, which create and maintain secure employment and it is in the inefficient firms that crises and unemployment arise. In the vast majority of cases it should be possible to introduce productivity without lay-off and, in fact, Mr Aliaga Kelly, managing director of a cork pain' manufacturing firm, was in a position to indicate that his own firm had introduced such a scheme and that it had the effect of increasing wages, discontinuing saturday work, increasing employment and affording greater security of tenure. An industry which by increasing productivity is able to expand its production and its exports sufficiently, will absorb any redundancy created. At the same time the overall national effect of a productivity drive is to expand the national economy and to mop up the areas of unemployment. This has been the effect experienced in Europe.

Further, an agreement between management and labour on cooperation in productivity does not mean the end of collective bargaining. Under any private enterprise economy there will always be a need for the employers' organisation to represent the point of view of those who promote, own, and manage the business, and the need for the trade unions to represent the workers who man the industry and derive their living from it. That these viewpoints should differ is natural and within reasonable limits, it is by no means an unhealthy feature in the economic organisation of a democracy. In fact, the best guarantee of success in productivity is the existence of strong employers' organisations and strong unions, provided both have a full sense of their responsibilities to the community. The most striking instance of this is in the Netherlands. Prior to

1940, the management/labour relations in the Netherlands were no better and no worse than in other countries, but the invasion of the country brought the employer and trade union leaders together in a manner that nothing else could have done. Dutch managers now began to think of the Dutch trade union leaders not as antagonists, but as fellow countrymen. The Dutch employers created employment openings for all the former trade union leaders so as to prevent them from being taken away to forced labour and they continued to deal with them. Funds were, in fact, made available on loan by the employers to the old trade unions. This led to the growth of considerable mutual appreciation and respect, and the common resolve that after the war each party, while maintaining its separate viewpoint and separate loyalty, would cooperate with the other in rebuilding the economy. The result was the creation of the Dutch Foundation of labour in which both employers and workers are represented. This is a voluntary organisation. It has also resulted in the creation of another organisation, the Social and Economic Council backed by government authority. In these organisations, Dutch management and labour cooperate in fixing national wage rates, controlling the cost of living and preventing pressure groups from taking an undue share of the national income. They have thus achieved an industrial harmony unparalleled in any other country. In fact, there has been no strike in the Netherlands since the war, with the exception of some minor and unofficial incidents of little consequence and one official strike, which must be unique in the history of industrial relations: one employer refused to follow the national agreement and the workers were withdrawn. At a later stage in the strike, the Employers' organisations asked the unions if they required financial assistance from the employers in the promotion of the strike. It is impor-

tant to note one point, emphasised by Mr Vermeulen at the joint seminar, and that is that this agreement between the Dutch employers and the Dutch Trade Unions derived not from the weakness, but from the strength of the Dutch Trade Unions.

In this country, we have suffered no such national calamity in recent years as that suffered by the Dutch, but we are nonetheless faced with an emigration problem which threatens our very existence as a nation and which should be a challenge to us all. We have, moreover, in the approach to good management-labour relations certain advantages. There is no cleavage in this country between a working class, on the one hand, and a hereditary ruling class, or a great capitalist class, on the other. There is, in fact, little class distinction of any importance. Moreover, we are a deeply religious people and in overcoming suspicion and prejudice and in the effort to agree on a fair deal as between management and labour we can rely on moral and social principles which both management and labour hold in common.

Our emigration problem is caused in part by our failure to provide adequate opportunities for employment, but also by the fact that other countries offer our emigrants a higher standard of living. To create employment and to raise our living standards, we must develop our export trade. We can do so by increasing our productivity and this can be achieved by concentrating on the human factors. In this country, because of our history, we are still lacking in confidence and we are prone to believe that our industrial export potential is very small by reason of our geographical location or lack of physical resources and our limited home market, but there is already evidence that these handicaps can be overcome by developing the human factors and that an industry which is served by people, who have the right

outlook and character and skill, as well as good organisation, is very well placed to compete with others who are relying only on their advantageous situation in relation to physical factors.

To prove the export potential of a small country with few physical resources, it is no longer necessary to quote Switzerland's watch industry with its 98% exports. We can find plenty of good examples at home. Ireland has the largest single brewery unit in the World. Its products are sold all over the World, as are our Dublin biscuits. It may be suggested that these are old established industries, but one can quote examples of new export achievements. A recent marketing drive has enabled a Dundalk tobacco firm to sell its cigarettes in East Asia. A Dublin factory, established in 1949, is engaged in the manufacture of electrical equipment and other products. 40% of its output is exported to many parts of the World. Their success is attributable to new techniques, which they have worked out for themselves. Ireland has the most up to date Wallboard factory in these Islands. A substantial proportion of its output is exported. A Dublin cake-making factory, recently established, is now the largest cake exporting firm in the world, exporting over 50% of its output. The list of exports is growing each year and includes also such items as: shoes, whiskey, confectionery, cement, glassware, plaster board, machinery, radio, motor cars, paper and cardboard, textiles and clothing.

Perhaps the clearest evidence of what an Irish industry can achieve by good organisation and management and with-

out access to any physical advantages may be seen in the record of a firm engaged in the making of rope in Newbridge. This firm now employs over 500 people and 50% of its output is exported to many parts of the World. Incidentally much of it goes to the middle west of America, where it is converted into Cowboys' lariats. Its raw materials are purchased in East Africa. Its finished products are also sold in East Africa.

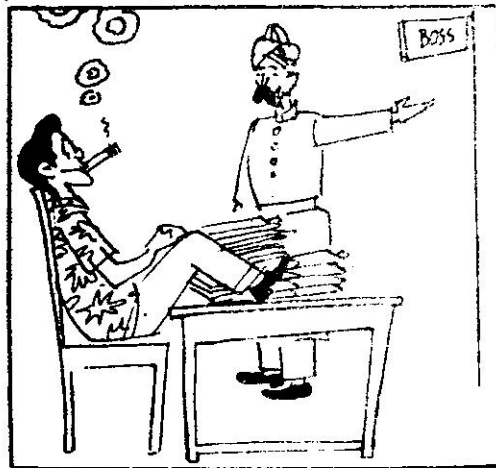
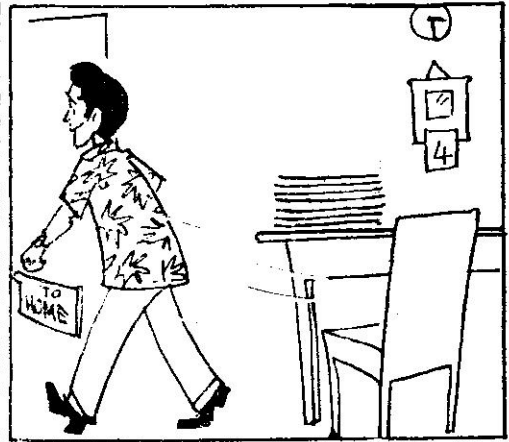
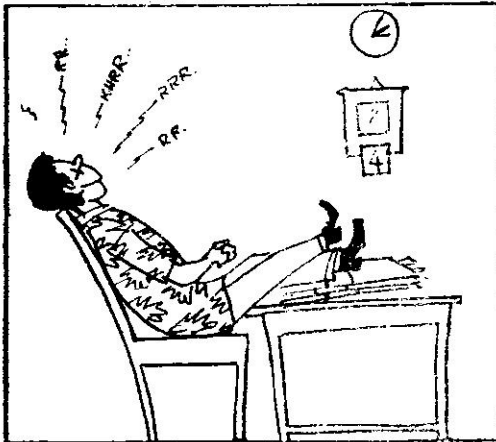
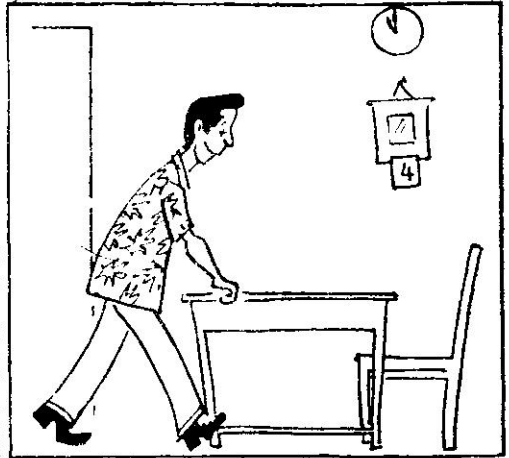
Perhaps there are still some lingering doubts as to whether an Industry, located in Ireland, and not based on our own raw materials can compete in the world market. These doubts are at least not shared by a Japanese transistor radio manufacturer and a Dutch piano manufacturing company, and others who are about to open large factories in the Shannon Free Trade Zone. These Companies are committing themselves to very substantial capital expenditures.

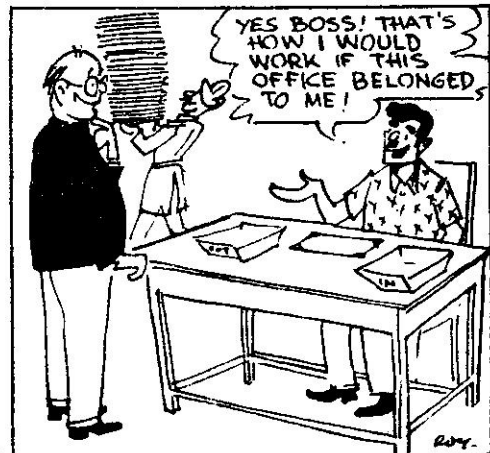
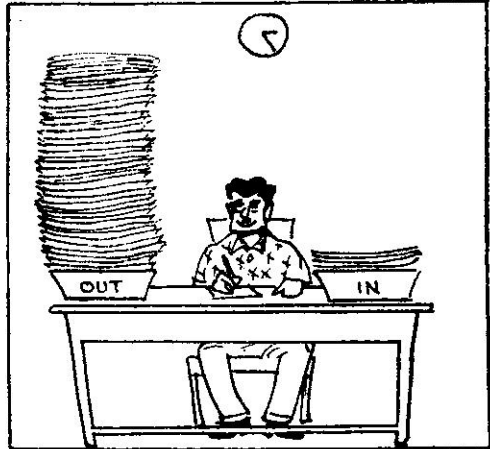
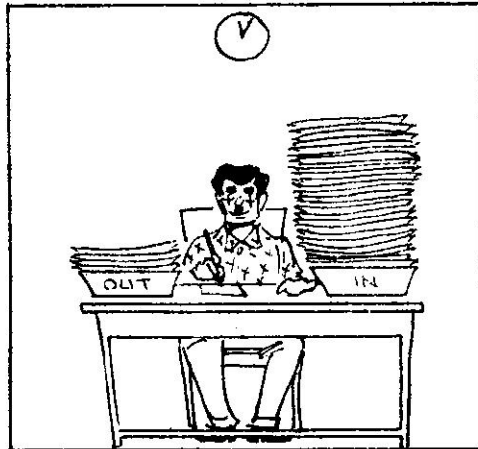
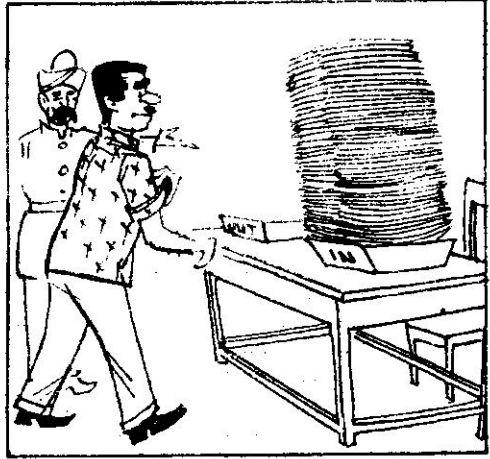
The promotion of an export industry requires considerable skill in marketing and this is a matter in which we have been seriously deficient. In fact, until recently we were quite out of touch with modern marketing techniques. This situation is beginning to change, partly owing to the good work which is being done by Coras Trachtala Teo (they have recently announced the adoption of an admirable training scheme) and by a few individuals, who have acquired skill and experience in this field, who are conscious of our deficiencies and who are endeavouring to spread the gospel of *productivity* with a sense of dedicated purpose.



**The world will beat a path to the door of the man who
can make a better mouse trap than another.**

RALPH WALDO EMERSON





The Concept of Productivity*

G C BERI**

Productivity is one of those subjects about which much has been said and written in recent years. Despite the wide attention paid to it, there seems to be a lot of confusion about the concept of productivity. Various authors have defined it in different ways. Likewise several different methods for its measurement have been suggested. The concept proves elusive when one tries to get exact definitions or design methods for numerical measurement of productivity. The word 'Productivity' when used even in technical discussions covers a range of different meanings, and the significance of many 'productivity indices', which are currently compiled, are often far from clear.¹ This is an indication of the complexity of the concept.

PRODUCTIVITY may be defined as the ratio between the production of a given commodity measured by volume, and one or more of the corresponding input factors, also measured by volume.² But it would make a material difference in the very concept itself, according to whether one or another of several different factors is considered. Thus productivity may be of labour, capital, power, raw materials etc., or a combination of two or more of these factors. However, in actual practice the measurements hitherto made by most authors, including the OEEC and the Bureau of Labour Statistics (BLS) of the USA, are concerned with one of these forms of productivity viz. labour, productivity being taken as the ratio of output to labour input. In fact, *productivity* has almost become a synonym of *productivity of labour*, for it is always understood to denote the latter, unless otherwise qualified.

Productivity of labour is open to several interpretations according to the meaning given to the terms output and labour input. For instance, labour input may be used to denote either (a) production workers or operatives, that is labour used for a definite group of operations, say, manufacture of goods from raw materials in a given condition, or (b) all workers including labour used in the preliminary work or preparation of raw materials, and also part of the labour corresponding to the manufacture of machinery, equipment, power etc. The estimate of productivity in each case will differ. However, the first approach, namely to use labour input to denote only production workers is commonly used, probably because it is less complicated and easier to measure. Still the problem is not fully solved since labour may be counted in different ways, e.g. according to hours actually paid, whether worked or not, or

* Part of the author's thesis (to be shortly published in book form) on *Measurements of Production and Productivity in Indian Industry with special reference to some methodological aspects*; awarded Ph D, University of London, January 1960.

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¹*Productivity Measurement Review*, May 1955, OEEC.

²*Measurement of Productivity*, 1952, OEEC.

hours actually worked, whether paid or not. The general practice seems to be to take paid employment as labour input in case of direct studies of productivity measurement, say, at plant level, and hours worked, in studies with the help of secondary sources. Similarly, several difficulties arise in the precise definition as well as measurement of output. These difficulties (not listed here for want of space) are not peculiar to productivity indices alone; they also arise in the construction of production indices.

We may now consider the possible uses of productivity measurements. What purposes do these productivity indices serve? There seem to be three important uses of such indices: (a) general economic analysis (b) intensive industry studies and (c) evaluation of work at the plant level. Productivity measurements can be used for shaping general economic policy, for forecasting national income and output, occupational shifts, labour requirements, etc. They are also used in determining the distribution of the fruits of industry and thereby in some sense they are relevant for collective wage bargaining. At industry level also, such measurements are very helpful. Comparisons of productivity changes within an industry over a period of time, as also between two or more industries, can indicate various significant facts, regarding technical, economic and managerial aspects of industry. At the plant level, such measurements may throw light on an aspect of *managerial effectiveness* in the individual plant or group of plants under the same management.

Reverting to labour productivity, it may at first sight appear that variations in the productivity of labour must be due to *labour*. If however, the definition of productivity is examined care-

fully, it would be clear that any factor affecting output or labour input may have an influence on productivity. In fact, much of the confusion results from the fact that the number and variety of factors affecting the productivity of labour are generally not fully appreciated.³

“Since labour is only one of the input factors, labour productivity data should be interpreted with the utmost caution. In particular one has to guard against two possible dangers in analysing such data: (1) Danger of placing undue emphasis upon what can be done by workers to increase production (2) Danger of giving insufficient attention to problems of what can be done to increase production by making a more efficient use of the other factors of production’.

Because of these dangers and other limitations, the concept of labour productivity has been subjected to criticism by experts, whose points of view are summarised below:

Professor H S Davis has pointed out the incompleteness of this concept. His doubts are: Can total input be completely expressed in labour terms? Can the efficiency of industry be fully measured by the ratio of physical output of labour effort put forth, including the sum total of actual and embodied labour? Professor Bye provides some help on these questions when he identifies the basic elements of production as “(1) efforts (2) ability (3) saving (4) land space (5) natural materials (6) risk-bearing”. Of these six elements, man-hours can be used to measure only the expenditure of effort and ability and even then, man-hours can only be a rough measure of these elements, since they do not register variations in the

³Methods of Labour Productivity Statistics, ILO, Geneva, 1951.

⁴ILO: Higher Productivity in Manufacturing Industries, Studies and Reports, New Series, No 38, 1954.

degree of effort or grade of ability expended.⁵

According to John W Kendrick, the chief objection to output per man-hour as an indicator of productivity is that it reflects inter-factor substitution as well as changes in overall productive efficiency. Only by relating output to all tangible inputs can it be determined whether there has been a net saving in real costs per unit of output, or conversely, a gain in productivity.⁶ Fabricant's point of view is similar. When other resources are used in significant volume, and change occurs in the volume of such resources used (which is almost always the case), a measure of productivity based on a single resource might tell us little or nothing of change in the efficiency with which this resource was being utilised.⁷ It might not even point in the right direction. The late Dr Rostas, a pioneer in the field of international comparisons of labour productivity, recognised the importance of other types of productivity measurements "... in industries where this proportion (i.e. share of labour in total costs)⁸ is small, and the importance of other factors in total costs high, the measurement of labour productivity only may not lead us very far without the measurement of other input factors".

This point of view needs to be particularly borne in mind in underdevelop-

ed countries, where labour is abundant and therefore cheap. A change in labour productivity in such countries might well be misleading; for productivity may be increased in an establishment or industry by purchasing components or partly processed materials from elsewhere, or by installing capital equipment.⁹ As T Barna also points out: If problems of production are approached from the viewpoint of *capital employing labour*, the cheapness of labour relative to capital is one of the main factors determining methods of production, and money costs of production are of paramount importance. If, on the other hand, the view is taken that *labour employs capital* (and not the other way round) to increase its standard of life by capitalistic methods of production, *dear labour* becomes the object of policy and not one of its determining factors. To quote S Tilles: the choice of only one concept of the general term *productivity* is unfortunate, since it seems to imply that an increase in productivity necessarily means an increase in production (with possibly concomitant distribution problems) or less labour (with possibly serious technological unemployment). Productivity is by no means limited to this interpretation alone, despite the fact that output per man-hour is a convenient index when making economic comparisons.¹² Tilles uses the concept of

⁵DAVIS H S : *The Industrial Study of Economic Progress*, University of Pennsylvania Press, Philadelphia, 1947.

⁶KENDRICK JOHN W : *Productivity Trends—Capital and Labour*, Occasional Paper 53, National Bureau of Economic Research, 1959.

⁷SOLOMAN FABRICANT : *Basic Facts on Productivity Change*, Occasional Paper 63, National Bureau of Economic Research, 1959.

⁸Words in parenthesis are our own.

⁹DR L ROSTAS : *Alternative Productivity Concepts in Productivity Measurement*, Vol 1 (1955), European Productivity Agency, OEEC.

¹⁰Many examples can be easily cited of increase in productivity by more efficient use of capital equipment.

¹¹T BARNA : *Note on Productivity of Labour—its concept and measurement*, *Bulletin of the Oxford University Institute of Statistics*, Vol 8, July, 1946.

¹²S TILLES : *Productivity in Underdeveloped Countries*, *International Labour Review* (ILO), December, 1955.

productivity as the ratio of output to input in a more general sense. The significance of this general concept, as he points out, is not merely that productivity of other resources may be measured, for measurement of productivity is only the first step. What is really important is the improvement of productivity and, if we insist always on productivity in the sense of labour productivity, we shall be led by our definition to concentrate primarily on labour saving techniques.¹³

The ILO Productivity Mission to India pointing out the confusion prevailing over labour productivity in this country, observed in its Report: . . . To many in India who tended to think of productivity exclusively in terms of labour productivity, the only way of increasing productivity seemed to be the installation of new, labour-displacing equipment. It was thought that retrenchment would be certain and new capital investment necessary. A consequence was that many employers and all trade unionists were wary of the consequences of raising productivity.¹⁴ The usual method of measuring productivity in terms of *labour productivity*, although the most convenient for vari-

ous reasons, tends to concentrate attention on the productivity of capital equipment. Even in the more advanced countries the growth of automation and the very heavy cost of new plant in many industries is rendering the full utilisation of capital resources sometimes more important than the fullest utilisation of human resources. It may pay to have a few men to spare if, by doing so, an expensive piece of plant can be more fully utilised. This is even more true in countries where unskilled labour is plentiful and cheap.

It follows from the foregoing that the concept of labour productivity unaccompanied by other related measurements is not appropriate in underdeveloped countries, hence the need to develop an alternative concept or concepts.

In view of the shortage of capital in India, it might be helpful to measure the productivity of capital equipment and/or of raw materials and fuel. The matter, however, is not so simple as it seems at first sight for in practice many difficulties arise while measuring total productivity or productivity of any factor other than labour. We must, however, as far as possible, measure the total productivity.

¹³Ibid. It is interesting to note that in the article referred to, Tilles attempts to measure the productivity of industry in Israel by taking value added as output and foreign currency requirement as input.

¹⁴ILO Productivity Missions to Underdeveloped Countries I, *International Labour Review*, Vol LXXVI, No 1, July, 1957.



The fine art of executive decision consists in not deciding questions that are not now pertinent, in not deciding prematurely, in not making decisions that cannot be made effective, and in not making decisions that others should make.

Productivity in Wider Perspective

RAMNATH A PODAR*

After long centuries of inaction and stagnation, India has begun to bestir herself into purposeful activity. Every succeeding five-year plan for the economic development of the country bids fair to become increasingly ambitious so that the goal of raising the living standards of our people and of securing for India her rightful place as a great and prosperous country may be realised within a measurable distance of time. The need for promoting a wider understanding and appreciation of the concept of productivity as a means *par excellence* of increasing the nation's wealth and of giving as wide an effect to it as possible in our economic activity is thus both real and urgent.

A GOOD deal has been said and written on the subject of productivity. Shorn of all learned jargon, productivity simply means the employment of devices conducive to the most efficient use of resources in order to produce maximum wealth at the lowest possible real cost. Stated in these terms, the practice of productivity is not entirely new or modern. Skill and ingenuity in the use of resources and the desire to conserve them for subsequent utilisation are human traits as old as civilization itself. The employment, however, of scientific methods for making the best use of manpower, machines and materials is a recent development, largely stimulated by the all-embracing needs of the last war and by the necessity of remedying the ravages inflicted by it on the economies of most of the belligerent countries.

Germany and Japan, which were probably the worst-affected countries, have staged their recovery with a speed and thoroughness that has caused the post-war world to marvel at their achievement. In spite of the partition of

her territories and the consequent diminution of her resources, West Germany has succeeded in rebuilding her economy on impregnable foundations so that her people have begun to enjoy prosperity on a scale that would have been dismissed as utopian scarcely a decade ago.

The re-emergence of Japan as a great industrial country is also a heart-warming story. Stripped of all her far-flung empire, post-war Japan was reduced to her insular size, with some of her great cities burnt to ashes and her economy in complete ruin. Undaunted by their reverses, the Japanese people set about rebuilding their homeland with a singleness of purpose that has yielded them amazing results and the world an abiding lesson that, given the will to prosper, no obstacle can thwart a nation in marching forward. To mention one example, during the war the bulk of the Japanese textile industry was destroyed. The Japanese used the calamity as a great opportunity and rebuilt the enterprise on entirely new foundations so that today, in spite of all her war-time misfortunes, Japan is still the world's foremost exporter of textiles.

*Industrialist; Chairman, Podar Sons etc.

The examples of these two countries show how immense are the opportunities for the economic regeneration of our own country. Following nine years of sustained planning, the Indian economy is on the whole in fine shape. The achievements of a generation have been telescoped into a few years. The advance in the coming years will, if the anticipations of the planners come true, be even more rapid. There will be more factories in the public and private sectors; more and more capital goods, imported and domestically made, will be brought into use, and industrial raw materials will become increasingly available with the development of the other sectors of the economy. There will thus be a greater mobilization of enterprise, machines and resources, all of which will doubtless take the country many steps forward towards the economic goal.

The point for consideration, however, is whether the mighty apparatus, with the aid of which we want to increase the country's wealth, can function effectively and yield the desired results unless the man behind the machine is also animated by the enthusiasm of the planner and the producer. There is no doubt that modern machines and methods are indispensable for progress, but no less vital is the role of labour. The issue of higher productivity is thus basically one of human relations. It is a complex issue, especially in countries that are comparatively new to industrialisation. There is still a deep-rooted distrust of the employer as a class, which was accustomed not many decades ago to play Providence to the workers. Such an attitude no longer influences the actions of most employers today since they are convinced that the economic regeneration of a large country like India is essentially a cooperative undertaking. Those few who still hark back to the bad old days are overcome by the disability of what may be termed as managerial obsolescence.

It is, therefore, one of the cardinal principles of progress that we should carry labour with us in whatever we choose to do. We will be able to win the worker's cooperation if we shed the illusion that he is no better than a wage-slave and that the employer is his bread-giver. It is equally necessary to discard the familiar cry that production will increase if only men work. Ours is a democratic country and higher levels of production, whether in the public or the private sector, can be attained only with the enthusiastic cooperation of labour. Indeed, as years roll by and the industrial development of the country gathers greater momentum, the working class will acquire greater importance.

How then are we to enlist labour's enthusiasm to the cause of higher productivity? There should be a managerial revolution in the sense that managements, whether in the public or the private sector, which are not up to the accepted standards of efficiency should shed their infirmities and rehabilitate themselves in the eyes of their workers by becoming more efficient. The effect of such a reform on the minds of the workers is truly great, for, apart from being inspired by a sense of security, they will begin to take pride in an undertaking that becomes noteworthy for its stability and progressive outlook.

Again, the distance that separates the worker from his employer should be shortened. The sullen and indifferent attitude of labour both towards its work and its employers is largely due to this unfortunate fact. It is true that security of service, efficient machinery, good working conditions and monetary and non-monetary incentives play a great part in securing higher productivity, but these gains are of no abiding value if they do not also bring satisfaction to the workers. Indeed, incentives are most important and they have been proved to perform miracles, especially in places where better methods of work-

ing exist. Even so, their limitations as well as of the pay packet have been widely recognised by experts. "The mistake of the worldly wise", says a writer, "who like to say that 'the only effective incentive is the pay packet' is not so much that they overlook other sources of motivation as that they fail to observe the complexity of this motive itself. We all love money, but we love it most for what it enables us to do. To some it may mean chiefly beer and circuses, to others it means greater security, or a better chance for one's children, or greater opportunity for promoting a project for reforming the world. *The pay-packet theory is not a bad one to start from, but it is apt to stifle thought precisely at the point where thought should begin.*"

In India, no matter what the employer wills, whether he belongs to the public or the private sector, the level of wages is bound to increase in the course of years so that the search for the worker's satisfaction will have to be sought elsewhere and away from the pay packet. Perhaps, the most effective non-financial incentive that can draw labour closer to management is for the employer or his chief executive to *take personal interest in the welfare of every individual worker*. Such intimate contacts between the employer and his men may not be possible in large concerns, but four or five officers of senior rank can always undertake this mission. To listen to the wants and wishes of the workers, to help them in the hour of their need and to visit their homes on occasions of joy and sorrow are some of the methods by which a real community of interests and comradeship can be established between management and labour. Indeed, the solicitude of employers towards labour can be shown in many ways outside the range of the statutory amenities granted to it.

How to secure human satisfaction is, however, not the problem of one factory

or of one industry or of all industries, but it is the problem of the age. Nevertheless, it is capable of solution because in the ultimate analysis both the employer and his employees have the common stake of ensuring the progress and prosperity of their concern, since it gives the means of livelihood to both. This fact of interdependence should make it possible to promote more friendly and fraternal feelings between the two: an attitude that forms such a striking feature of human relations in the American industry.

To confirm this statement, I can do no better than quote no less a person than Stalin. Many years ago, in an interview to the famous German writer, Emil Ludwig, the Soviet leader declared that the Americans "are a sound people, or at least there are many sound people there, sound in mind as well as in body, *sound in their whole attitude towards work and towards every day facts*. The practical business side of American life and its simplicity has our admiration. In spite of its capitalistic character, the customs which are in vogue throughout the industrial and economic life of America are more democratic than in any European country." Stalin further said: "In industry and business they (the Americans) are simple, and our workmen who have become leaders of industry here notice that fact immediately when they go to America. There it is *difficult to distinguish between the engineer and the simple workman while they are at their job.*"

We have to try and create such happy conditions in India. Promotion of fellow-feeling will stimulate among the workers a genuine pride in their jobs. Full advantage should be taken of such a change of heart on the part of labour by taking it into confidence about the aims and objects of the concern, its short and long-term programmes, and various other matters pertaining to its activities. It was recently stated that productivity

in a company in Britain rose by the mere fact that its intentions were published. The workers felt themselves bound to cooperate with the management in realising a goal so frankly stated by it.

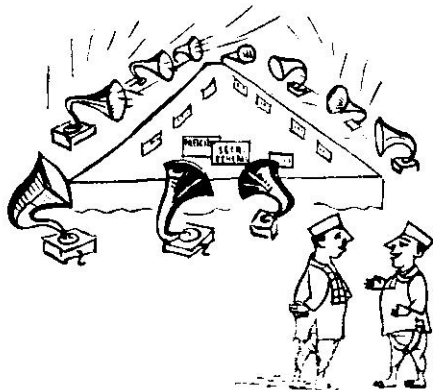
Human nature is a complex thing and no amount of expert study can fully comprehend its mainsprings. How the workers can be induced to take sincere interest in their work and to give off their best, depends on various factors, material as well as psychological. Nevertheless, an essential pre-requisite for higher productivity is that the workers should find satisfaction in their work. Such a feeling can be generated if the job they are required to do has a certain minimum interest. It is precisely for this reason that I have always insisted that our factories should be equipped with first-class and upto-date machines so that the men operating them might derive real pleasure from operating them.

The other advantages of modernisation are equally impressive and in recalling them I would like to quote what I said in my speech at the annual general meeting of the Millowners' Association, Bombay, in April 1958, in my capacity as Chairman of that body: "I suggest that the goal of giving a fair deal to the shareholder, of paying higher wages to labour, of supplying quality products to the consumer at reasonable prices, and of contributing higher reve-

nues to the Government should be striven for through the medium of the machine. *It is in fact the superior machine that will help to reduce the cost of production by a margin sufficient to accommodate these four-fold demands on us.*"

My objective is not to deliver a sermon on the duties and obligations of management to labour. The subject, however, is of outstanding importance and deserves to be treated not in the traditional, but in a realistic manner, taking into account the fact that productivity is an indispensable factor for our national progress and that labour cannot be called upon to exert itself to the utmost unless it is given its *quid pro quo* in the shape of both material and psychological gains. An improved standard of living, with all its advantages to the worker and his family, and the conviction on the part of labour that it is held in real esteem as a significant contributor to national progress will go a long way towards the realisation of the goal of higher productivity.

I may add in conclusion that productivity should not be measured merely in terms of input and output. We must seek to produce more wealth by giving at the same time full satisfaction to human needs, hopes and aspirations. It is only then that our endeavour to make it possible for our people to lead a fuller and better life will be amply rewarded.



"Saves a lot of trouble !"

Productivity in Plastics

In terms of materials, it is said that we are in the plastics age. Just as in other lines, India has not made that rapid progress in plastics, such as has been witnessed in the highly developed economies like United States, where they have worked out specialised mechanisms for each specialised job in the plastics line. In India the machinery installed for plastics manufacture is of conventional design and the country so far has depended very largely on imported materials. The pattern of consumption is also elementary in the sense that the industry caters twice as much to direct consumption as to industrial applications. Actually, plastics is a type of material with protean industrial applications, ranging upto vehicles, ships and even rails. That in fact would probably be the measure of the extent of economic development in a country. So gauged, India should still be counted as backward in the development of plastics, though considering the fact that the industry started from scratch in the post-war period, the progress, measured by the volume of output (30 million lbs.) has been phenomenal.

But the future is a lot more promising. There is provision in the Third Five Year Plan not only for the manufacture of machines for making plastics goods but also for indigenous production of the raw materials required. By the end of the Third Five Year Plan, therefore, India is likely to have a highly developed plastics industry, drawing upon indigenous resources.

In order to help in this process, NPC sent out a Team of competent and experienced persons to study the working of the plastics industry in Italy, the USA and Japan: the three countries which have gone ahead in the plastics line. The Team has returned with a considerable fund of knowledge and submitted a report to NPC. Below is given the substance of their findings and recommendations, which it is needless to say have their importance in the context of the large scale development programme, associated with our Five Year Plans.

PLASTICS industry in India is essentially a post-war industry, though two or three thermosetting compression moulding units producing electrical accessories and other articles started operations before the war. The industry today consumes approximately 30 million lbs of plastics material and produces most of the consumer goods required in the home market, besides exporting a small fraction. The Third

Five Year Plan target for plastics manufacture is 165 million lbs by 1966. Even after attaining this target, India will yet remain a small plastics manufacturer, for the major producers even now manufacture far larger quantities.

	In million lbs
USA	4500
UK	1200
Japan	900
Italy	400

The more important part of the Third Five Year Plan proposals, however, is the indigenous manufacture of processing equipment and moulds and also of the essential raw materials to be processed from basic chemicals available in the country. Attention will also be given to the training of technical personnel required by the industry. The USA has a Society of Plastics Engineers and the Team has recommended the encouragement of such technically competent groups of personnel¹. What probably is more important from the point of view of economic growth is that a number of other major industries are coming up in the country, such as petroleum refinery, fertilizer manufacture, rayon etc.—which can supply the essential raw materials for plastics manufacture. Even the traditional industries, such as cotton ginning, coal, lime stone etc. would also be in a position to feed the industry.

On the other hand, plastics industry itself is showing up an almost infinite variety of industrial applications, as were witnessed at the International Plastics Exhibition held in London in June 1959 which the Team saw and has commended upon in the body of their Report²: blow-moulded containers, high clarity packaging films, ropes, nets, boats, fan blades, pipe fittings, coating of steel and hardboard, car bodies, corrugated roof light sheeting, aircraft components, swimming pools, surgical instruments, complete shoes, even such things as guided missiles³.

¹Plastics Industry in USA, Italy and Japan, NPC Report No. 4, September 1960, page 88.

²Ibid, chapter 3.

³"...Special phenolics materials having very high heat resistance are finding application in guided missiles. The nose-cone of the Jupiter 'C' guided missiles, for example, is basically a phenolic material reinforced with fibrous cord and certain other specialised materials. Some of these phenolics have actually been able to stand up to 30,000°C for a few seconds whilst re-entering the earth's atmosphere. Considering that stainless steel vaporises at 4,500°C, this is a remarkable property...." Ibid., p. 18.

The Team has drawn particular attention to the following recent developments⁴ in the plastics line:

1. The use of PVC pipes in England for conveying water and for liquids in chemical plants.
2. Use of PVC films in Japan for protecting rice crop against weather and helping quicker plant growth.
3. Use of polyethylene film to prevent seepage of water in canals, buildings and road construction.

It is in view of these possibilities and the use this country could possibly make of advanced techniques of plastics manufacture that the NPC sent out, through the good offices of the International Cooperation Administration of the USA, to study: (1) recent technological advances in the plastics industry in regard to machines and materials, processing techniques, designs of moulds, equipment and products (2) productivity of plastics industry with particular reference to general organisation, factory and plant layout, standardisation of equipment and products, simplification in industry, plant maintenance, cost and quality control, labour productivity and marketing (3) methods of imparting technological education in plastics as well as practical training for personnel at all levels of industry (4) organisation of small scale industry in plastics, techniques of production, planning and marketing. Avenues of production which would admit a larger man-power employment of plastics materials already in production in the country namely PF and UF moulding powders, laminates, polystyrene, and also polyethylene and PVC expected to be manufactured shortly; (b) study of the types and quality of Italian plastics products and their processing techniques; (c) study of newer plastics and applications for

⁴Ibid., p. 12.

which there is scope for development in India such as reinforced plastics, polyesters, epoxides and polyamides; (d) the manner in which application for vinyl and urea resins has been developed in other countries, particularly in Japan.

Before going out to study these modern developments, the members of the Team who already had considerable experience in the line, made intensive productivity study of the domestic industry, its organisation and working. The Team found that for the most part, plastics manufacturers were concerned with volume output, obtained through larger imports of raw materials rather than with the most productive application of resources. Management, plant layout, house-keeping, even the whole set up of some of the factories appeared to the Team to be far from satisfactory. In spite of favourable market conditions, suitable equipment and availability of operatives, some of the units in India were in the opinion of the Team working uneconomically. The Team particularly marked the absence of cost and quality control, maintenance standards and healthy conditions. "...One cannot escape the conclusion that the major problems of the industry in the present circumstances is the management problem." As this is a general problem in India, the Team's Report has a significance beyond the limited field of plastics. Incidentally but not insignificantly, the Team has recorded: "It must be mentioned here that firms which had some form of foreign affiliation or collaboration were organised on the best possible lines as they had the benefit of the experience of their associates abroad".

Another point to which the Team has drawn attention, with particular reference to Japan, is that of plastics engineers, starting manufacture on their own, as proprietors. This development

has also a general significance with important social implications.

The Team's Report is rich in the extensive exposition it contains of various plastics raw materials, the wide variety of their applications, properties and possibilities, given alongside a large volume of necessary technical detail, illustrations and charts. Machine tools and processing techniques have also been dealt with in considerable detail, accompanied by a fairly large number of diagrams, illustrations and statistics. Altogether, the volume of technical material digested in the Report is of a character and significance which would be of great help to men working in the industry.

Against the background of their newly gained knowledge, the Team has tried to impress on the Indian Plastics manufacturers, the need to improve machines already installed in factories. Particular attention has been drawn to the following factors: (1) the heating system whereby material can be plasticised quickly so as to get faster productivity (2) the making of sprueless or pin-point moulds so as to save waste through sprues and through gates (3) fitting hoppers to very large containers preferably through a controlled vibrator to make the flow of material constant.

The Team has devoted a fairly large space to some aspects of productivity such as plant layout, storage and handling of materials, plant organisation, machine tools and maintenance, production planning and control, cost control, quality control, standardisation, simplification and specialisation, the application of incentives, safety and hygiene, labour management relations, and last but not the least, marketing. All these productivity factors have been amply illustrated from the experience of the Team in the three countries visited by them. "The Team is convinced about the benefits that can accrue to the industry by applying the tools and techniques of productivity."

⁵Ibid., page 6.

⁶Ibid., page 83.

Noise Reduction and Productivity*

J D LEA**

Personnel Officers have long concerned themselves with heating, lighting, ventilation, and other commonly accepted aspects of working conditions. Studies of the effects of noise show that it has been too long neglected as an element in working conditions. Because we are apt to accept noise as part of industrial life, its insidious increase often goes unnoticed. It is a problem everyone tends to leave to others, or to the future, and a positive approach and policy are needed if improvements are to be made.

REPORTS on the effects of noise range from detailed scientific investigations to theories which try to prove some effect on health, birth-rate or personality complexes.

There is growing evidence to indicate that noisy conditions:—

(i) Increase fatigue and strain from a job, although output may be maintained.

(ii) Affect output and efficiency in certain jobs which require concentration, e.g., there are several studies showing increased output in clerical and typing jobs after noise reduction.

(iii) Affect quality of work, e.g., the same studies clearly show less errors after noise reduction.

(iv) Have some effect on coordination, reaction time and sensory perception and are a possible cause of accidents in some situations resulting from nervous distraction and tension.

(v) Increase the time newcomers take to settle down and reach full efficiency, particularly when they have no previous factory experience.

(vi) When particularly bad, or when taken in conjunction with other factors, have some effect on labour turnover and absenteeism.

(vii) Hinder effective communication and therefore slow down training and form a potential cause of mistakes and lower output.

(viii) Cause some degree of impaired hearing particularly at high frequencies. Often this may not be apparent to the person affected but the impairment is progressive.

Everyone has a degree of adaption to a high noise level but it is a slow process. There is some indication that this adaption effects efficiency at the start of a shift and that resistance decreases towards the end of a long shift.

The Nature of Noise

The effects of noise vary with its intensity and pitch. The analysis of noise is, therefore, concerned with the measurement of both these factors and the instruments used are the sound level meter and the frequency analyser.

For a given intensity of noise, a higher frequency is much more objectionable than a lower one. This fact should be borne in mind when planning

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noise reduction schemes. The predominant frequencies must be established so that the greatest reduction in noise may be achieved at the lowest cost.

Intermittent noises are often more intolerable than steady notes and it follows from the foregoing that a high pitched intermittent note, such as a sudden hiss or screech, should be eliminated or reduced before the regular low notes or thuds.

Measuring Noise

There are various methods of measuring noise. In this country the 'decibel'—a logarithmic unit of measurement—is used. It is generally agreed that exposure to a level of over 90 decibels is harmful. As the ear perceives noise on this logarithmic basis, 100 machines sound only twice as loud as 10 machines of the same type. An extensive programme of noise reduction may result in what is apparently a disappointing decrease in decibels but this may represent a considerable percentage reduction in the noise experienced by the hearer. A decibel reduction of 10 may represent as much as 60 per cent in loudness to the hearer.

For example, one study showed that in a department of 11 machines, one machine had a noise level of 95 decibels, while the other 10 had a noise level of 75 decibels each. The total noise level in the department was 94.5 decibels.

If the noise level of the one machine was reduced 10 per cent, the total noise level in the department would be reduced by 7.1 decibels. On the other hand, if the noise level of the other 10 machines was reduced 10 per cent the total noise level would be reduced by 0.3 decibels; this action would, of course, be far more expensive.

As a result, it follows that considerable improvements may be achieved;

for example, in a noisy press shop, by concentrating on only a few machines. Accurate measurement of these conditions is fundamental to successful noise reduction. The National Physical Laboratory will visit a factory with mobile equipment and make measurements and give advice. In addition, there are also available several specialist consultants and manufacturers of noise reducing materials.

Methods of Reducing Noise

The methods of reducing noise can be grouped under three main headings:—

1. At Source

(i) The use of hydraulic rather than mechanical processes.

(ii) Intermittent escaping noises are particularly irritating and can be easily and cheaply reduced by fitting simple baffles to inlets and exhausts on pumps and engines.

(iii) The replacement of metal gear wheels by laminated plastic gears.

(iv) Use of welded rather than riveted joints.

(v) Regular maintenance of machines; in particular, by lubrication and the replacement of worn or damaged bearings.

(vi) Light alloy materials, plastics or laminated woods, where appropriate, could be used to replace cast materials.

(vii) Open gears, belts and shafts should be enclosed.

(viii) The general noise level of, for example, a machine shop may mask vibration which is often a major cause of noise. It can be tackled in many ways but again particular attention should be paid to high frequency vibration and it is important to realize that the use of inappropriate means can, in some cases, increase vibration. High frequency vibration can be reduced simply by increasing the weight of the

offending part or structure. Sheet metal casings, guards or cowlings are often not adequately supported and, as a result, they pick up vibration and act as a sounding board. Sheet metal can often be strengthened by ribs or flanges which have the effect of shifting the frequency to a less audible level.

To damp vibration in sheets and panels, anti-drumming compounds, generally with a bitumen or plastic base, have been developed. The compound prevents the development of resonant frequencies known as drumming. They can be applied with a brush, trowel or spraying plant and are claimed to be waterproof and rust-preventive. ,

2. Transmission of Noise

In many factories noisy processes are located in buildings which must, of necessity, also contain areas used for quieter factory activities or offices.

Much unnecessary noise is often transmitted from one to the other through the structure of the building. This can be reduced by the following practices:—

(i) The use of insulated mountings between the machine and the structure of the building. There are many insulation mounting and resilient pads which may be made of rubber cork or felt; various steel spring insulators are also available. The platform on which a machine stands can be insulated from the floor by placing the concrete foundation in a rubber-lined pit. Insulated mounting of all types of machine should be a standard procedure whenever layout changes occur, or new machines are installed. In all cases mountings should be carefully chosen, according to the load and frequency of the noise, if they are to be effective.

(ii) Resilient washers can be used between bolt-heads on machines.

(iii) Non-metallic gaskets and washers can be used to break sound transmission along pipes.

(iv) The lagging of trunking, pipes and structural supports can reduce noise transmitted to quieter departments.

(v) Good results have been achieved by simply placing a sound absorbent partition between noisy and quiet departments, or by grouping and screening off new particularly noisy machines. As a last resort, it may be necessary to enclose a particularly noisy machine in an acoustically lined hood or booth.

3. Absorbing Noise

Noise emanating from any source is also passed through the air. The effect of airborne noise tends to be cumulative as it is constantly reflected from walls and ceilings and is amplified by recesses and trunking.

Great developments have taken place in the use of absorbent materials to reduce reflected noise. However, although easy to apply, it is the most expensive method of reducing noise and such measures should be tried only if the remedies above have been exhausted.

The following are some of the commonly used methods:—

(i) Acoustically absorbent tiles and sheeting to cover ceilings and walls. These may be made of mineral wool, asbestos fibre or fibre board.

(ii) Double partitions and double glazed windows.

(iii) Carpets and curtains where appropriate.

(iv) *Sonosorbers*: These are conical shaped units (approximately 12" × 12" × 24") with a perforated aluminium skin and a glass fibre insert. They are hung from the ceiling and claimed to be simply installed, movable

during layout changes, easily cleaned and not affected by oil or dust.

(v) Ear-plugs may be necessary in some instances and as a last resort.

Conclusion

It is suggested that noise may be properly included as an aspect of working conditions. There is general agreement that there is a connection

between sensible improvements in working conditions and efficiency. Although noise reduction is not a field for the amateur, it is nevertheless a matter for the attention of personnel officers. They should be alert to unnecessary noise and should create and maintain the interest of all departments of management in the problem and the many possible remedies.



Materials Handling

A A NIAZI*

MATERIALS Handling is generally defined as the handling of raw, semifinished and finished material, in packs of different forms and sizes, or in bulk loads. Handling consists of picking up, transporting, putting down and arranging of materials. Purpose of all handling is to enable production units to work on the material and prepare, out of it, a finished product and then to take it to the ultimate consumer. Materials handling is thus a necessary service provided for the purpose of realising the goal of production of goods for consumption. No piece of product can reach a customer till materials are procured from a supplier, received, checked, stored, transported to and arranged for an operation. Product will not near completion any further till the semi-finished piece is picked up, transported, put down and arranged for the subsequent operations.

The manufacturing process is thus a chain of events that starts with acquisition of raw material, passes through a series of forming and assembly operations to checks and tests for quality and quantity, and ends with the delivery of the product to an ultimate consumer. This indicates that the material is constantly in a state of flow. Efficiency of manufacturing unit depends to a very large extent on the ability to maintain this flow of material, without undue stockpiling of semi-finished material, to keep the operations going.

This in other words refers to the efficiency of organisation, methods and equipment of materials handling.

Importance of Materials Handling

Materials handling problems assume importance due to a number of factors:

- (i) It has been observed that the cost of handling alone accounts for about 20-25 per cent of total manufacturing costs. This includes cost of labour engaged, depreciation, interest, maintenance and running cost of equipment.
- (ii) It is not uncommon to find each part being handled 50-60 times while it passes through the chain of manufacture. Expressed in tons, it is found that on an average 59 tons of material are handled for every ton of finished product.
- (iii) Labour spent on handling cannot be salvaged, since it only helps in the creation of anything that can be sold. Handling itself does not produce any goods.
- (iv) It has been observed that large banks of semi-finished parts are maintained either in the main stores, in temporary stores (semi-finished stores) or near the machines. This is required to be able to keep all operations supplied with the material. Though in-process storage is essential, it also involves a lot of capital tied up in semi-finished pieces.
- (v) Direct operators, at many places, have to spend a considerable proportion of

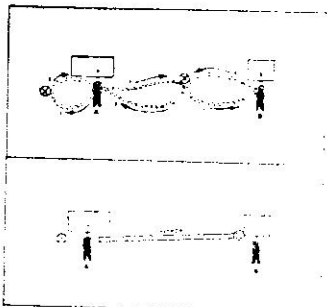
*Technical Officer NPC

their time in materials handling. This situation often leads to the idleness of machines due to lack of material and/or men, as well as to the misutilisation of direct operator's time.

Principles of Materials Handling*

If such is the expanse of the problem and so serious its repercussions on the efficiency of an enterprise, it becomes necessary to consider the problem in the light of certain principles and rules. They are:

1. Best handling is no handling at all, hence question and try to eliminate every step where handling is involved.
2. Try to keep materials at the height at which they are to be worked upon. Avoid picking up and putting down.
3. Where avoidable, do not put materials on the floor. Use a pallet or platform. This is suggested also because material on floor tends to accumulate instead of moving.
4. Try to keep distances over which



material is handled as short as possible. Avoid cross and back hauls.

5. Let gravity work for you. Let material roll or slide down chutes wherever possible.
6. Try to handle in bulk. Wait, as far as practicable, till there is a big enough load instead of carrying one by one.
7. Have sufficient boxes, platforms or containers available at the work place, (preferably two), such that the operator can remove a piece from one when he is ready to work on it and place it in another when he has finished his work.
8. Do not try to economise on labour employed for fetching and carrying unless this can be done without adding to handling by direct labourers.
9. Keep gangways clear, for cluttered up material obstructs traffic.
10. Always keep materials handling equipment moving (terminal time principle) —Waiting at terminals for loading or unloading leads to inefficiency. Select equipment that can readily pick up or put down or be detachable from the prime-mover, e.g. tractor trailer combination.
11. Measure efficiency of handling equipment and method by the units (tons, gallons, pieces etc.) handled per man-hour. Economy is measured by comparative expense per unit of material handled.

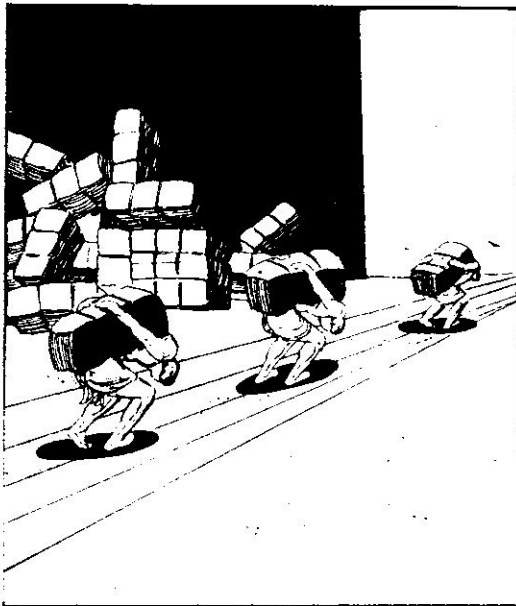
The summary statement of principles of materials handling, given above, shows it is not only a matter of acquiring costly equipment. Small industries seem to shrink away from any discussion on these problems because they identify materials handling with expensive equipment which they can neither purchase nor put to economic use. A rational analysis of materials handling would show that there are a number of ways, besides the procurement of costly equipment, of effecting improvements in the existing methods of materials handling.

*Source : "Introduction to Work Study", ILO; and "Materials Handling" by Harry E Stocker.

Improved methods can be devised after making a thorough study of the existing method with the use of flow process charts and flow diagrams (Method Study), critically examining each step in the chart and thus developing a better method. Simply reorganising the work in some other way or provision of simple equipment without any considerable expenditure leads to significant economies.

A few examples where these principles can be applied or have been implemented may make the point clearer.

1. It has been very commonly seen that cloth packs (each pack containing about 20 yds of cloth)



are carried to the baling machine in twos or fours. Each bale has about eight such packs. The worker has, therefore, to make at least two trips for each bale packed. A simple hand cart would considerably reduce the total distance travelled by the man for a given volume of materials handling. The same man



can be used at some other point in the time saved. Units of cloth handled per man hour will thus go up.

2. An unskilled labourer was once observed to transfer milled steel bars of size $12'' \times 1''$ diameter in twos from ground or a tote box to wooden case on a two-wheeler. He had to transfer about 100-125 such bars at each work place. Applying the terminal time principle one would see that the worker meant for transporting material is tied up at each point in transferring material from floor or a tote box to his two-wheeler. It would be better in such cases to provide light boxes which could be picked up and either put on a two-wheeler or emptied into a wooden case. This will enable a swifter movement of man and material, thus also helping to reduce the banks that had to be created at each machine. Instead of material for a full day

being supplied to each operator, swifter movement could have made it possible to supply lesser quantity each time.

3. Layout of the work areas (in a medium scale unit) in the section dealing with filling and seaming of cylindrical containers full of a liquid was studied. The observations of the three operations of filling, weighing and seaming are described below:

Working height for all the three operations was different causing the containers to be lifted each time. The cycle being:

pick up container and put on working height actual operation (either filling, weighing or seaming); pick up container and put aside.

Operators had to be extremely careful in picking up and putting down containers for fear that the liquid contained may not be spilled.

Applying principle 2 stated above, working heights were raised and lowered to enable the operator to slide the container towards him or away from him. This reduced the time of filling from 0.41 minutes per container to 0.32 minutes per container. Seaming time was reduced from 0.725 to 0.293 minutes per container. Second nozzle of the filling machine could now be commissioned so that the operator could produce two containers at a time. Slight changes in the set-up thus gave a saving of about 59% of time in the production of one container.

The same containers were carried 50 ft. to godown and stacked after cleaning. One man was required to carry the containers and a second worker was engaged on cleaning and stacking. Principle

number five was applied here and a chute was installed. The chute consisted of two angles welded together by strips at different places so that the seamed container could roll down to the godown. One man was thus eliminated and put to work at other sections of the factory. Total saving from the improvements in materials handling was of the order of Rs 2343 per year.

4. In the weaving shed of a textile mill, weavers worked on two or four looms. According to rules, the two-loom weavers had themselves to collect weft from the godown, while the four-loom weavers were to be supplied with weft at the loom, by one worker. Empty bobbins (pirns) were collected by another set of workers, who had to walk through beam alleys, sit down in between looms under running belts, sort out and fill empties in bag, go over to conveyor window and empty the bag on the conveyor. Studies showed that the picker walked three miles and had to kneel down 313 times to pick up pirns during an 8-hour shift. Weft distributor to 4-loom weavers could reach only 300 looms out of the 452 that had to be supplied with weft.

Stoppage of looms when two-loom and some four-loom weavers waited for weft was found to total upto a working time of 6.87 looms in an eight-hour shift. This was found to be so in spite of attendance by the nearest weaver while one went to the godown.

Application of the principles of handling again helped in so arranging the manner of weft and pirn handling that the company got savings of the order of Rs 19,300 per year. The only improvement made was by way of a trolley with space for both filled bobbins (weft) and empties. The worker went to

central points of the loom shed, distributed weft and also collected pirns. Weavers nearest to that point themselves brought empties and took away bobbins from the trolley.

Analysis of problem and basis of decision

The above examples indicate that the nature of materials handling problems varies from place to place, but the guiding principles can be applicable to any situation. What is necessary is to thoroughly analyse the present condition and then develop an improved method. Sometimes it may be necessary to just reorganise the present method while in other cases it may be economical to go in for some sort of equipment e.g. fork truck, conveyor, crane, tractor and trailer. It is advisable to analyse

the alternatives and compare them to arrive at a sound decision. Some factors to be compared are (1) Units handled per man-hour (2) Man-hours saved (3) Time of direct operator saved for production (4) Total cost of equipment, that is, owning and running costs (5) Period of ammortisation in case of equipment.

Conclusion

Productivity requires a rational approach to all sectors of industrial working. Materials handling constitutes a considerable portion of the total cost of manufacture. A thorough analysis and continuous attention to the problem coupled with an intelligent application of the guiding principles of handling have given results and will be found to be of great use to all who use them.



"...When I was Deputy Chairman of British Railways, a nationalized enterprise, I was called upon to meet a body of trade unionists who were very concerned over an industrial dispute. They were a little doubtful about meeting a General as a representative of a great industry—and I was a little nervous myself. For about six hours we had hot argument, with a good deal of table-thumping and many red faces. Finally, we reached what I hoped was a reasonable compromise and I suggested to the three secretaries of the big railway unions that a little refreshment was called for. As we walked down the dark and rather melancholy corridor to my office, one of them said to me 'General, that must have been a very strange experience for you.' 'On the contrary,' I replied 'the atmosphere of the last six or seven hours has been completely familiar to me for years.' 'Oh, but it can't be,' he protested, 'you don't have trade unions in the Army!' 'No,' I said, 'But we have allies.' That is the real essence of the matter. Productivity, which you are here especially considering, is only one of many important aspects of industry. Like all the rest, it depends very largely on this realization by all in an industry that they are on the same side, that they are allies. Their greatest and common interest is that they should have a prosperous industry—and that means an efficient one....."

Field Marshal Sir William Slim

Inter-firm Comparison

M S SRINIVASAN*

It often occurs that a manufacturing enterprise finds its business losing while that of a neighbour operating apparently under identical conditions flourishes. An analysis of their respective productivities (inter-firm comparison) would bring out the real factors involved as also the possible solutions for bringing the below-level firm on to a parity of productivity.

GENERAL economic conditions no doubt influence the performance and financial results of manufacturing and other business enterprises. Some of the enterprises may be affected more than other units. How far efficiency and working results are affected by changes in the overall economic situation cannot be found out by a reference to any system of internal records and statistics.

It is the usual practice in some of the progressive enterprises, to make a comparative study of their results with pre-determined standards for various factors of production. But the peculiarities of the specific manufacturing unit would escape notice in the comparison. There are possibilities of errors in the fixation of standards and errors arising out of subjective valuation. The main purpose of inter-firm comparisons is an objective study of the working results of an enterprise.

Inter-firm comparisons enable a comparative study of the results of a firm in the light of the average results of similar firms in the same period. In the usual procedure of comparing with standards or budgets, the measuring

rods that are employed are estimates under hypothetical conditions anticipated in the period. In the method of inter-firm comparisons, similar firms working under identical economic conditions contribute their results to a common pool, and the average possible performance under the same set of conditions is found out to be used as the basis for comparison. The approach to the comparative study is objective and prevents the effect of general economic changes from exhibiting a distorted picture.

Inter-firm comparisons make it possible for the management to find answers to such questions as the following:

1. What is the position of our firm in the industry?
2. How has our firm fared in comparison with similar firms in the industry?
3. What are the points of differences and peculiarities?
4. If abnormal differences are noticed, what are the areas where investigations should be made to discover the special reasons responsible for the results?
5. How far are differences in results attributable to the impact of general economic changes and to internal factors?

Inter-firm comparisons provide management with key figures of operating

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performance and financial results so that they can know the areas of inefficiency and the means to be adopted for improvements in working their factory. The system enables managements to be aware of relative efficiencies and to take steps to rectify defects in the organisation, plant layout and utilisation of resources. One point in favour of this method of comparison is that it does not add to the burden of collecting statistics but nevertheless contributes to the meaning and comprehensiveness of available data.

Inter-firm comparisons, giving a set of financial and operating ratios, can be very enlightening to practically every line of management. Detailed comparison of results of various aspects of operation and efficiency would be useful to departmental managers and superintendents. The system of comparison should be flexible for all purposes and levels of management.

From the point of view of the economy as a whole, the average results derived for use in inter-firm comparisons would indicate the progress and fortunes of the industry in general. This would be useful for directing the economic policies of the nation for proper growth of industries. The system of inter-firm comparisons has been in operation in several countries; and the availability of comparative reports has been greatly appreciated by managements.

The importance of inter-firm comparison as a tool for management efficiency and productivity can never be overemphasized. It is therefore necessary that such inter-firm comparisons should be undertaken by trade associations and chambers of commerce and industry, which are in position to understand the specific requirements and peculiarities of individual industries. It would be possible for them particu-

larly from their position of trust and responsibility to introduce and operate a system of inter-firm comparisons.

The steps necessary to organise inter-firm comparisons are:

1. managements in industrial units (who are members of the Association) should be apprised of the benefits of the system;
2. a few manufacturing units in the industry may be enlisted as participants in the project;
3. a proper questionnaire may be drafted and sent to member-units, to fill in required particulars;
4. the material received should be analysed and average performance results for the period worked out for use of members, taking into consideration technical differences, size of firms and location;
5. the average results should be tabulated and copies sent for the use of members of the project;
6. the whole material should be handled, keeping in view the general requirements of industrial management; and
7. strict secrecy of the information submitted by individual units has to be observed.

Obviously, such inter-firm comparisons need competent statistical advice. Information intended to be of value to top-management should reflect the comparative overall financial and productive efficiency of the individual enterprise in the light of the average results of the industry. Care should be taken to see that while detailed ratios may be worked out, the presentation to top management should not be crowded with such detail.

Some of the ratios that can be of use to the top management and their utility for the purpose of comparison have been given on the following page.

Ratio

What the ratio indicates

- 1 $\frac{\text{Profits (before taxation but after depreciation)}}{\text{Capital employed}}$
- 2 $\frac{\text{Profits (before taxation but after depreciation)}}{\text{Total Sales}}$
- 3 $\frac{\text{Cost of production}}{\text{Sales}}$
- 4 $\frac{\text{Sales}}{\text{Capital employed}}$
- 5 $\frac{\text{Cost of administration}}{\text{Sales}}$
- 6 $\frac{\text{Cost of selling and distribution}}{\text{Sales}}$
- 7 $\frac{\text{Fixed assets}}{\text{Total assets}}$
- 8 $\frac{\text{Sales}}{\text{Average stocks}}$
- 9 $\frac{\text{Credit Sales}}{\text{Total Sales}}$

This ratio indicates the success of the business, the rate of return on capital, profitability and utilisation of asset resources. It also shows the competitive position of the products in the markets and the popularity of the enterprise.

This ratio indicates profitability in operation. It also indicates the margin of profits in sales value.

This ratio shows the margin of profits and efficiency in production as reflected in costs.

This indicates the turnover of capital. The higher the ratio, the more efficient is the use of capital employed.

This ratio shows what fraction of sales value is being absorbed by administrative costs. This would point out to average administrative efficiency in money terms.

This ratio would show the efficiency and expense in the field of sales and distribution.

This ratio indicates the extent of investment in fixed assets. It would also show the funds left over for current financing.

This ratio indicates the stock turnover and the frequency with which sales are effected.

This ratio would indicate the extent to which credit sales are being made as an indicator of effective sales policy.

The rate of return on capital employed (ratio 1) depends on the nature of the industry and the general economic situation in the country. If the capital has been used in an efficient way to finance a large volume of production and sales, the return is likely to be higher. If the sales of the individual firm is found to be lower than the average, it would be necessary to make a detailed analysis and inquire into the possibilities of obtaining higher volume of sales with the same volume of capital employed.

The use of the second ratio is for the purpose of examining the relative operating efficiency of a particular firm in the light of the average performance in the industry. The ratio also shows the

availability of profit margin in the particular unit in comparison with the average profit margin for a set of units. Taken together with the third ratio the comparison can indicate the production efficiency by means of cost comparison.

The fourth ratio can be used for making a comparison of the rate of turnover of capital of the particular unit in relation to the average for the industry. This ratio can show the relative speed with which the production is being marketed.

The expense ratios considered, alongside the ratios of the cost of production to sales, would show comparative performance in the fields of production,

administration and sales. These ratios would indicate how the particular unit has fared in comparison with the average inter-firm results.

The financial ratios show in broad outline the utilisation of funds for the purpose of investment in fixed assets and meeting the working capital requirements of the enterprise. The ninth ratio shows the extent of credit sales and also how quickly funds get released from credit sales. A comparison of the individual firm's sales performance with the average sales results would show the relative efficiency of the marketing policies in the particular unit.

Apart from these ratios, other ratios may be worked out for a cross-section of industry; for this purpose, statements with blank spaces for filling the results of the individual firm may be distributed to the members of the group. Individual firm would fill in the blank space and the central organisation would compare its results with the average of similar firms. Comments may also be incorporated in the report to explain variations. A comprehensive analytical statement, with the explanations, would be prepared and form the basis for deciding policies and for taking active measures towards promoting efficiency.

In addition to this statement, there is the need for preparation of detailed comparative information to be used by the executives in business enterprises. This should cover for example (1) cost of production of major categories of products (2) comparisons of labour performance and productivity results (3) plant efficiency comparisons etc. These reports are intended to be of use for levels of management where detailed studies are possible. Supervisors and foreman of factories and also the departmental managers would generally like to have detailed information for the purpose of study and for instituting measures for promotion of efficiency and productivity.

The cost comparison statement should follow the general pattern of the Profit and Loss Accounts of the industry and give the average results with the break-up of cost figures under important heads. Comparative results may be given either in the form of a statement containing the results of the individual units as also the average, or in the form of a statement of average results with indications of dispersion. The statement may suitably accommodate possible cost details though there may be differences in the variety of final products. The organisations that submit data for the purpose of cost computation should be advised to follow uniform accounting and costing procedures so that the data becomes comparable. This would also enable sources of variations to be easily identified and suitable measures adopted for the purpose of cost reduction and elimination of waste.

Productivity of labour and machinery of one unit are comparable with those of other like firms, with, of course, certain limitations. Those comparisons, however, would be useful broadly as an examination of the relationship between the overall effort associated with labour and machines and the output in different manufacturing units. The average results of productivity of labour and machinery should be presented in a suitable form, if possible, department-wise in the industry. The figures may also to be considered with reference to the total cost of production. This would enable the firm to have an answer to questions such as the following: (a) how do the productivity results of our men and machines compare with those of the average for the industry; and (b) what is the fraction of labour cost in manufacturing and how does it compare with the average result for the industry?

The above information may enable management to know the possibilities of improving efficiency of their machinery, as well as labour employed. This

may also form the basis for conducting enquiries into the causes of inefficiency and any point of dissatisfaction that may be prevalent among the workers.

Comparison in the field of selling and distribution may be done on the basis of the following facts: (1) comparative number of persons in the sales department (2) performance results in the form of sales (3) average selling expenses per 1000 units by products sold and (4) sales turnover ratio. Much, of course, would depend on the nature of the industry and the type of organisation built up for the purpose of sales and distribution.

Inter-firm comparison should be at least for a period of two years, to enable answers to be furnished to the following questions: (a) how are the average performance results this year as compared with last year? (b) how are the results of a particular manufacturing unit in both the years compared with the average results of the same period?

An inter-firm comparison project has necessarily to choose the type of firms whose results are to be included for computing average performance figures, taking into account various factors that contribute towards differences in performance:

- (i) *location*: cost variations on account of regional differences in the cost of transport, wage differentials and also special costs arising out of differences in the tax structure and state Government encouragement;
- (ii) *size of the firm*: the overhead expenditure, administrative costs etc.
- (iii) *technological standards*: the machinery of various types, models and ages etc.
- (iv) *product ranges*: pattern of production etc. related to the cost structure in the industry.

Considered theoretically, it is not possible to render comparability into an absolute concept. The aim of the inter-firm comparison is really to find out the factors that make the results different from one another and from the average within the general limits for comparison. The procedure that is being adopted in the choice of the firms is expected to ensure that the major elements are adjusted to render the results practically comparable. The reputation of the firm built over a period of years, the programmes and welfare measures of a particular firm that may attract and sustain good labour, and the policies of maintenance and replacement of machinery that might be adopted by some firms and not by others are some of the examples to show how many are the factors that may cause different results. The main aim of the inter-firm comparison is to stimulate management to find out what the differences are in the policies and approach to various problems of the industry, that are responsible for making the results of their own firms, different from the results of the average firm in the industry within the compass of comparison from the point of view of size, situation and product range.

The main difficulty or objection that may be encountered from any particular firm that may like to become member of the inter-firm project is the confidential nature of business matters, which firms do not like to be publicised. The objection may also be that they do not like their figures to be disclosed to competitors in the industry. The possibility of such information getting into the hands of others, to whom it is not intended to be accessible, is a fear, that is responsible for reluctance on the part of the management to participate in the projects of inter-firm comparisons. There is also the impression that the results of the firms included in the projects may not be really comparable.

Those fears would prove to be groundless, if managements realised that the project would be useful to them to spotlight their own levels of efficiency and also render their results more significant. In the procedure for the collection of the material and the operation of the project, the association or organisation that conducts the project must make the necessary arrangements for ensuring security of the information so that the confidence of the participants is developed.

The following are some of the practices that are recommended for adoption by central organisations to ensure that the material entrusted to them for the purpose of computing the inter-firm results are not publicised without the permission of the participants:

1. a system of code numbers may be adopted so that the names of the participants are not disclosed to many people;
2. the key to the code numbers should be held by the top officer who is conducting the project on behalf of the organisation or association;
3. the questionnaire, correspondence and all records relating to the figures must carry only the code number of the firms and not their names;
4. the receipt of information should be by a particular person in the organisation so that the identity of the firm is not disclosed to others;
5. the results computed should be made available only to the participants and not to outsiders unless all the firms agree that the information should be disseminated for general use of the people in the industry and the public.

For the purpose of running the Project, either of two methods may be considered for collecting the necessary data.

The primary method of approaching each one of the members of the project by sending an investigator to collect necessary information involves the possibility of a breach in the confidentiality of information and also increased expenditure in running the project. The alternative method of sending a questionnaire to be filled in by individual firms has the advantage of ensuring complete secrecy of the information submitted, and also speed in the execution and economy in the cost of administering the project. If the questionnaire method is adopted there is the necessity of defining properly the terms that are to be adopted and the type of information to be submitted by each member, contributing basic information to the project.

If the inter-firm comparison project takes into account only the broad outlines of results, that may be of importance to the management in industry, it may not be difficult for all the firms that join the project to supply the basic information in the required form. In the initial stages it would be even helpful to send an investigator around to explain to the firms the type of information listed in the questionnaire and the method of collecting the same out of the data available with the enterprises. This type of supervision and guidance in the collection of data would ensure uniformity and facility in the collection of information and also generate confidence in the management regarding the comparability of the results.

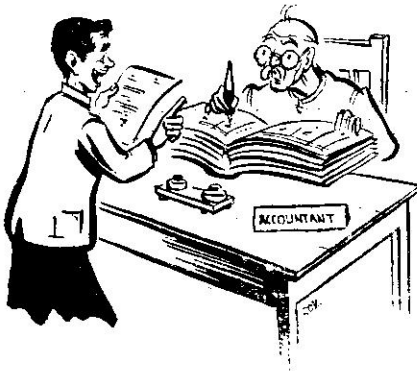
The adoption of the questionnaire method for running the project would economise the staff required and expenses involved. From the point of view of the individual unit that seeks to take advantage of inter-firm comparisons, the effort that will be required is limited to the compiling of information to fill in the questionnaire, and the comparison and study of the results on receipt of

standard statements from the organisers. The questionnaire will usually be a simple one, requiring in a standard form, some of the information that is regularly recorded for statistics and administration. The system of inter-firm comparison establishes an independent check on the efficiency of production, administration and selling and distribution activities of an enterprise. The benefits of such comparisons have been appreciated by the managements in Europe, the UK and the USA. Once the system is intro-

duced and operated in India, the value of the information supplied will be readily realised by industries that participate in the project. It would enable them to make objective assessment of their own results in physical as well as monetary terms. They would be convinced that the method of inter-firm comparison constitutes a useful tool in guiding their policies, in weeding out inefficiency in their manufacturing organisation and in improving the productivity of resource application.



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Productivity In Coal Mining

L R SHARMA*

Coal Mining is a primary basic industry without which few other industries can be undertaken. Coal still provides the motive force of the Industrial world. In our country it has a vital part to play in the fulfilment of the Five Year Plans. In fact, Productivity of coal mining can contribute substantially to raising the productivity of the whole economy.

In India, coal has been known since times immemorial. Even in its modern sense, coal mining in India is more than a hundred years old, yet its technical advancement has been far from satisfactory. In fact, quite a number of collieries may still be regarded primitive. This slow progress can be attributed to various factors, political and economic. Be that as it may, adequate thought has not been devoted to the scientific and technical progress of the industry.

THERE has been a marked increase in the output of coal: from 6 million tons in 1900 to nearly 50 million tons in 1959. The First World War gave a spurt to the coal industry and output went upto 21 million tons in 1919. With the end of war, the industry suffered recession particularly in the thirties. Coal was offered at Rs 3.56 nP or even less per ton but there were still no buyers. To keep things going, *slaughter* mining methods were adopted to win coal at the lowest cost to the mines without any regard to the loss of coal involved in the process. Substantial coal wealth was lost forever and some devastating fires were caused, losing not only the coal reserves but also valuable surface properties.

Under such adverse conditions, necessary capital was not forthcoming for introduction of machine-mining and modern method of working. Labour was paid the barest minimum and were

only partially employed. Many collieries worked only 4 days in a week because of lack of demand. No wonder, productivity was very low in the coal industry. It was less than 0.25 tons per manshift in the thirties. It was subsequently arisen to 0.41 tons by 1958. But the comparable figure for UK is 1.26 tons and for the USA 6 to 7 tons. The latest figures of productivity in coal-mining have been worked out statewise for September, 1959 (page 78).

Lately, things have been changing and some of the enlightened colliery companies are adopting modern techniques in mining methods and management. Probably it is due to the possible impact of development planned for the expansion of the public sector.

The Industrial Policy reduction lays down that coal is one of the industries, the future development of which will be the exclusive responsibility of the State. New units will be established in the public sector, but it will not preclude the expansion of existing private

*Deputy General Manager, Singarani Collieries Co. Ltd.

PRODUCTIVITY IN COAL MINES*

Field	OUTPUT PER MAN-SHIFT IN TONS		
	Miners and loaders	All persons below ground and open cast workings	All persons above and below ground
Assam	0.85	0.50	0.35
Raniganj :			
W. Bengal	1.20	0.61	0.43
Bihar	0.98	0.58	0.41
Jharia	1.01	0.59	0.40
Bokare	1.14	0.66	0.40
Girdih	0.49	0.33	0.26
Karanpura	1.58	0.82	0.59
Ramgarh	1.53	0.62	0.46
Jainty	0.39	0.33	0.21
Rajmahal	0.45	0.31	0.26
Daltonganj	0.82	0.59	0.40
Hutar	0.74	0.54	0.41
Madhya Pradesh	1.45	0.64	0.44
Bombay	0.87	0.45	0.30
Andhra	0.91	0.51	0.34
Orissa	1.73	0.56	0.39
Rajasthan	1.05	0.43	0.19
INDIAN UNION	1.12	0.60	0.41

*Coal Bulletin, Sept. 1959.

units. All the new mines being opened by government, are to be planned and worked on the latest methods of mining. The large coal companies are also modernising their collieries.

Since 1951, coal production has been steadily rising. The yearwise Annual output and employment statistics are given below:

ANNUAL PRODUCTION OF COAL

Million Metric Tons

Year	Production (million metric tons)	Average daily employment (in thousand)
1951	35.0	339
1952	36.9	342
1953	36.6	338
1954	37.5	332
1955	38.8	341
1956	40.1	334
1957	44.2	350
1958	46.0	364
1959	48.0	366

During the Second Plan, output was scheduled to increase from 38 to 60 million tons. The target for third Plan is 95 million tons. The Second Plan target has not yet been attained. While it is essential to step up coal output to target levels it is also important to do so at minimum cost, consistent with the overall economy of the country. So long labour was cheap, workers' performance was not considered of much significance in the cost of production. With the increase in wages from time to time particularly during and since the Second world war the wage bill has begun to acquire a significant magnitude in the cost of production. Today, wages form 50% or even more, of the total cost of coal production. Production increases by employing more workers and/or equipment and machinery does not necessarily mean increased production. Without improved productivity, the price line of coal cannot be held and any increase in cost of production ultimately falls on the consumers, including the workers themselves. On productivity depends the level of cost of production and the ability to compete. Better productivity means better working results for an undertaking and opening up avenues of employment for larger number of workmen on better terms and service conditions.

The coal industry employed in 1959, on an average 3.66 thousand workers for an annual output of nearly 48 million tons. Under the present working conditions and productivity we would need double the number of workers to produce 95 million tons by the end of the Third Plan. People are not ordinarily attracted to mining profession. It will, therefore, be difficult to find the additional labour required to fulfil the 3rd Plan target. If, however, productivity is improved by suitable measure the requirement of additional hands can easily be halved. This will also incidentally expose only half the number of persons to the hazard of mining.

The crux of the problem therefore is to increase productivity and "the ratio of productive achievement to the corresponding expenditure of effort, material, power, equipment and time must be as high as possible".

Productivity can be increased by

- (a) cooperation between management and labour.
- (b) improved working conditions, training.
- (c) mechanisation by introduction of modern machinery and equipment.
- (d) scientific planning and
- (e) incentive payments and control over recruitment of labour.

Cooperation between management and labour

Good human relationships at all levels in an undertaking is of paramount importance. The handling of human resources is much more important than the handling of finance and machinery. Any plan for increasing the efficiency of an organisation must be fully discussed with those expected to carry it out. There must be full and frank discussion with them and their confidence must be fully won. The authority formulating the plan must sell its idea at all levels. The implementation of a scheme is more difficult than its formulation. Unless the men who are to implement the scheme are convinced of its soundness and usefulness both to the organisation and above all to themselves, it will not succeed nor will productivity improve—the men, right on the floor level, must be made to feel that they are an important part of the organisation and are working not only for their material gain but for a larger objective such as the welfare of the community or the country. Let them feel the sense of belonging to the organisation whose main policy should be the wellbeing of the workers first, and of the management afterwards.

Then alone you can get the best out of them. All this is not easy to achieve, but upto the degree it can be accomplished would the efficiency and productivity of the workers increase.

Congenial environment of work leads to increased productivity. Well-laid out works with good light and ventilation pay handsome dividends on extra cost involved. Good working conditions will reduce the migratoriness of coal labour. A substantial part of labour engaged in coal mining is of migratory nature. They come to work in mines only to supplement their income. During sowing and harvesting seasons, they migrate to their villages. They do not get rooted to their place of work. With this type of shifting labour, productivity suffers. If attractive and comfortable living and working conditions are provided, it will create a permanent mining community wholly engaged in the profession. The productivity of such labour is bound to improve.

Training

Training within industry is important so that the workman can do his job more efficiently and with safety without waste of time or material. New entrants should be initiated into the profession by a short induction training programme. This will familiarise them with the conditions of work and types of job they are likely to do.

The supervisory and managerial staff should be acquainted with productivity techniques such as work study, time and motion study, job evaluation, materials handling, cost control, wage incentive etc. so that they could intelligently apply them in their day to day work. This will produce results even without additional capital investment and will effect considerable savings. With conscious knowledge of productivity techniques they should for ever be urging the adoption of improved methods of

work, cutting out waste and achieving all round efficiency and performance.

Mechanisation

The *pick and shovel* method of mining has to be replaced by mechanical means, if target of production envisaged in the third plan is to be fulfilled. The old methods must give way to new mining techniques, not only to improve performance but to lighten the work of the miner and offer him better working conditions. Mechanisation in itself is not enough to raise productivity. Its success depends upon the attitude of the workers. There have been unnecessary arguments against rationalisation of plant. Our experience is that if people are taken into confidence and the scheme is explained to them in all its aspects, particularly those affecting their own material gain in greater earning opportunities, they would not only welcome introduction of machines but would also work them

successfully. A skilled worker, like a machine operator, can certainly look forward to a more interesting and paying job than his counterpart, a pick miner. Introduction of machines cannot adversely affect the employment potential; for the crying need of the day is more and more staff and workmen to achieve higher and higher ceiling of production.

The trend in the use of machinery in coal mines and the quantity of coal cut and handled are given in the table below.

The pace of mechanisation has been fairly good since 1951, but still out of total output of 48 million only 12 million tons were cut by machine in 1959. The production of coal handled by mechanical loaders, and conveyors is still smaller. Assuming that 25% of coal is obtained from depillaring where coal cutting machines cannot be so usefully employed, even then the proportion of coal cut and handled by mechanical

TREND IN THE USE OF MACHINERY IN COAL MINES

(EXTRACT FROM COAL BULLETIN)

	COAL CUTTING MACHINES				MECHANICAL LOADERS		MECHANICAL CONVEYORS	
	Million Tons	Number in use	Quantity of coal cut (Metric Tons) per month	Quantity of machine (Metric Tons)	Number in use	Quantity of coal loaded per month (Metric Tons)	Number in use	Quantity of coal conveyed per month (Metric Tons)
1951	35	374	5,68,433	1,520	7	16,324	23	60,992
1952	37	380	5,95,007	1,565	7	16,504	43	74,856
1953	37	403	6,45,567	1,603	4	6,084	58	98,941
1954	38	435	6,83,041	1,570	3	7,855	73	1,15,431
1955	39	442	7,30,492	1,668	4	10,309	88	1,16,853
1956	40	454	7,63,486	1,680	4	8,188	91	1,46,406
1957	44	459	8,44,716	1,840	5	13,372	92	1,27,212
1958	46	470	8,90,625	1,895	5	20,590	67	1,26,780
1959	47	506	9,79,410	1,930	5	38,690	74	82,078

means is rather low. Much greater use of cutting machines, loaders, conveyors etc. is necessary, if targets envisaged in the 3rd Plan are to be achieved.

Scientific Planning

Planning on scientific principles is very important in achieving better results and higher productivity. Many large undertakings have a planning department to deal with expansion problems and opening of new mines. Haphazard mining to meet sporadic demands might show temporary results but for sustained and steady progress a well-thought out plan must be decided upon. Since smaller units may not have the resources to afford a full-fledged planning department, they can join hands and form a central planning department. If this is not feasible, planning may be entrusted to some of the competent executives in addition to their other duties.

Incentive Payment

Productivity in Indian coal mines steadily increased from 0.34 in 1951 to 0.42 in 1959. There has also been a considerable increase in wages during the period, particularly to have encouraged since mid-1956, but the increase in productivity has not been proportionate. It appears advisable to so reorientate the wage structure that higher wages should work as an incentive to higher productivity. If financial encouragement is given in the shape of incentive allowance linked with productivity, it will not only increase production and wage packet of the workers but would also reduce the costs of production and raise productivity.

In a group of collieries such a scheme was introduced. There was a steady rise in productivity, although the all-India figures indicate no such increase from 1957 to 1959.

OUTPUT PER MANSHIFT IN TONS AND WEEKLY EARNINGS IN RUPEES

(ALL INDIA)

Year	Productivity tons per manshift		Earnings Rs.	
	Miners and loaders	All persons below ground and open-cast working	Overall	Weekly earnings of workers
1951	1.03	0.56	0.34	12.77
1952	1.04	0.56	0.35	13.15
1953	1.05	0.57	0.35	13.68
1954	1.09	0.58	0.37	13.59
1955	1.10	0.59	0.38	13.29
1956	1.12	0.59	0.39	15.68
1957	1.14	0.61	0.41	18.80
1958	1.15	0.59	0.41	20.93
1959	1.13	0.61	0.42	21.81
Upto Sept.				

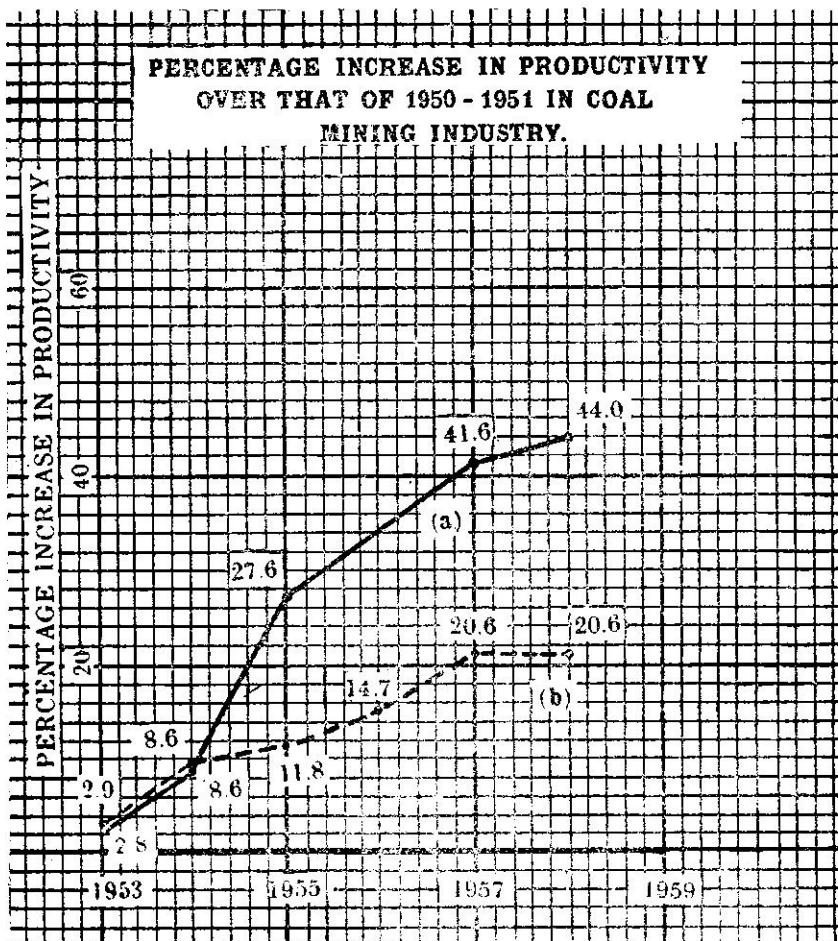
The graph printed on page 82 shows the statistical position of the select group of mines in which incentive schemes were in operation. The output in 1958 in these particular collieries showed an increase of 34.8% over 1950 and productivity by 44%. The comparative figures of manshift per 1000 tons of coal and reduction in cost per ton are indicated in the graph printed on page 83. In 1953 the manshift per 1000 tons was 4108 as against 2932 in 1958 and the reduction in cost was about Rs 1.2 million in 1958 over 1953.

It is true that not all the increase in output and productivity was due to the introduction of incentive scheme but it played a significant part in the achievement. Planning the new mine on scientific methods, introduction of machinery, control over recruitment etc. have also been contributory factors. The progress of the scheme has, however, been quite encouraging and productivity has considerably improved in those sections where it is in operation. In a particular section, for example, the performance has improved to 87.5% and the workers have been receiving bonus of 65% of their basic wage.

As the working of these mines constitute a good case study, additional information may be given here. In 1951 then output was 1.2 million tons. It has now increased to 24 million tons and by beginning of 1962 the rate of annual output will be 3 million tons. It would further increase to 72 million tons in the third plan. To achieve this, new mines are being opened. Standards of labour and staff are being laid down, right from the beginning, for these new mines so that proper control over recruitment

and performance of workers could be effectively exercised. Consequently, the comparative performance of labour in new mines is higher than in the older mines and productivity is as high as 0.75 tons per manshift in the new mines as against 0.30 in the older mines.

It need not be said that mining is a hazardous profession. An incentive scheme, when formulated, must take full cognizance of this fact. The incentive payment of supervisory staff should

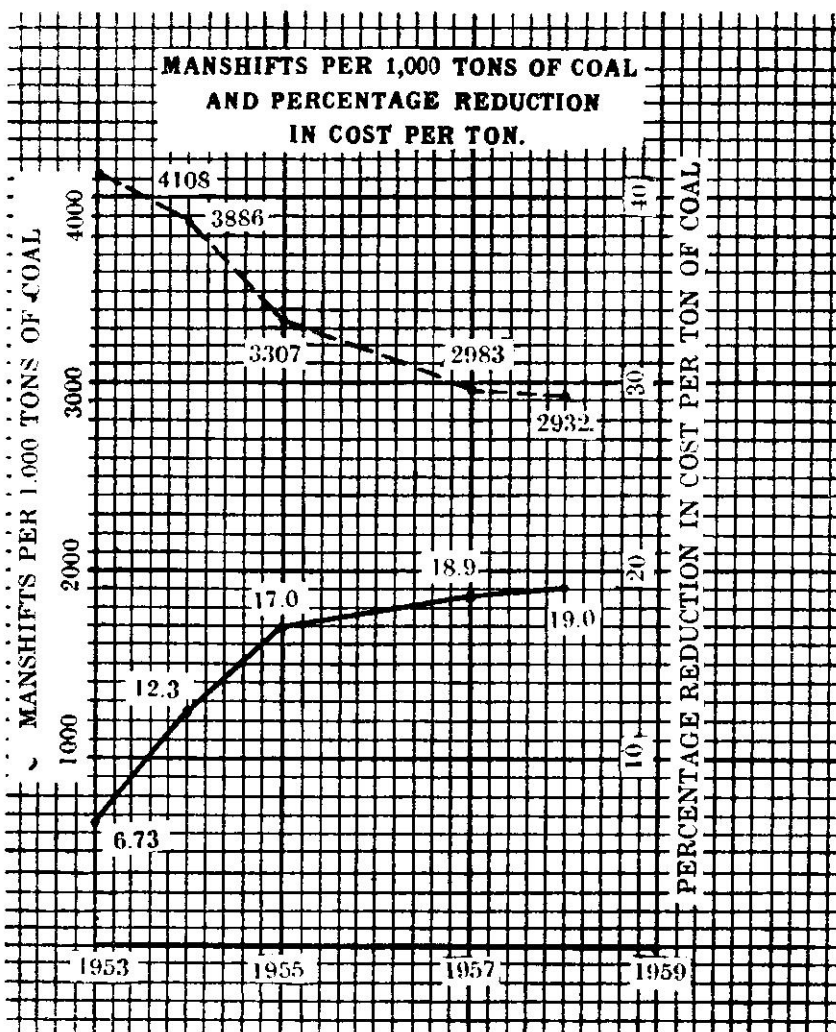


- (a) percentage increase in productivity in a group of mines where incentive schemes based on scientific studies are in operation
- (b) overall Indian Union figures

be dependent on effective safety arrangement for workers. It is only reasonable to suggest that in a particular month in which a fatal accident occurs, the staff incharge forfeit their bonus.

When the incentive scheme was first mooted in collieries referred to, the workers either openly opposed it or were indifferent to it because they apprehended that it was another ruse to get some of them retrenched. But it was

explained to them through their union leaders that the scheme was only to increase efficiency whereby the collieries could achieve better results in production costs, the benefit of which would be equitably passed on to the workers in the shape of incentive allowance. The fundamentals of the scheme were thoroughly and frankly discussed with them and they were assured by the management that *not a single person would be retrenched as a result of the*



introduction of the scheme. But any person found surplus would be transferred to a proposed Labour Training Pool with all the benefits of service assured. They agreed to try it out in selected group of workers. Since then the pendulum has swung to the other side and workers now actually demand that incentive scheme be extended to those sections of work where it has not been introduced so far.

In an expanding industry there is no question of any retrenchment as a result of improved productivity. Increased productivity on the other hand will stimulate development and

expansion of industry. It will help open new avenues of employment both within the industry and without.

The pressing need of the day is to raise industrial production if the country is to progress, as it must. But this should be done with due regard to the cost of production, to arrest inflation. Higher productivity alone can achieve it. It will also increase *per capita* income and raise the standard of living. Better living conditions and better food will eliminate two of the major causes of low productivity. Higher productivity will thus become a self-generating process to a remarkable degree.



- (i) Productivity is a great mystery and a great challenge.
- (ii) Industrial man, by and large, has done rather better, considering his inexperience in handling this comparatively new form of production, than he is often given credit for.
- (iii) The physical and social environment within which productivity occurs is the important variable, not the current attitudes of the individual actors who temporarily hold the particular stage: their script is largely written for them by the environment.
- (iv) No single remedy can be prescribed, neither the Protestant Ethic of Weber and Tawney, the human relations of Elton Mayo, the stock ownership or profit-sharing plan of an industrial consultant, not even the sweeter music or pastel paints in the shop or office; nor do the Americans have all the answers, least of all for themselves.

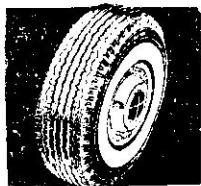
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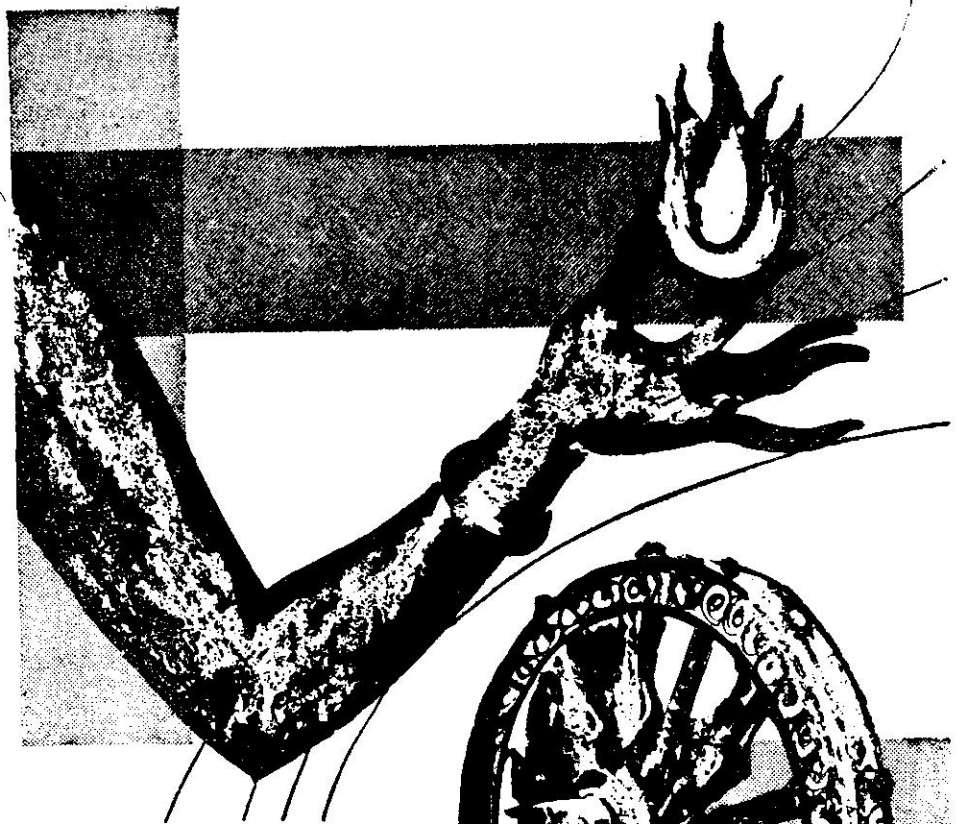


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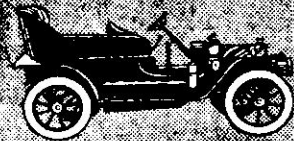
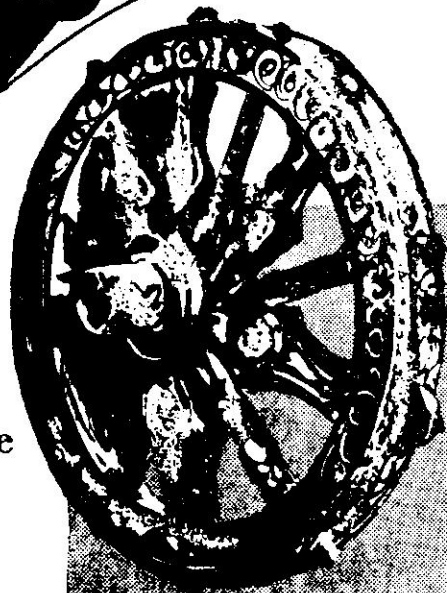
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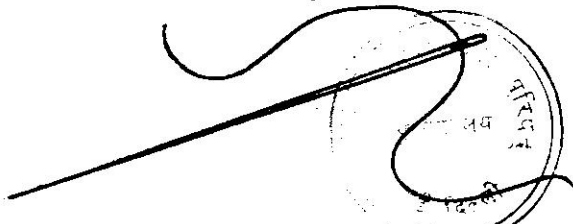
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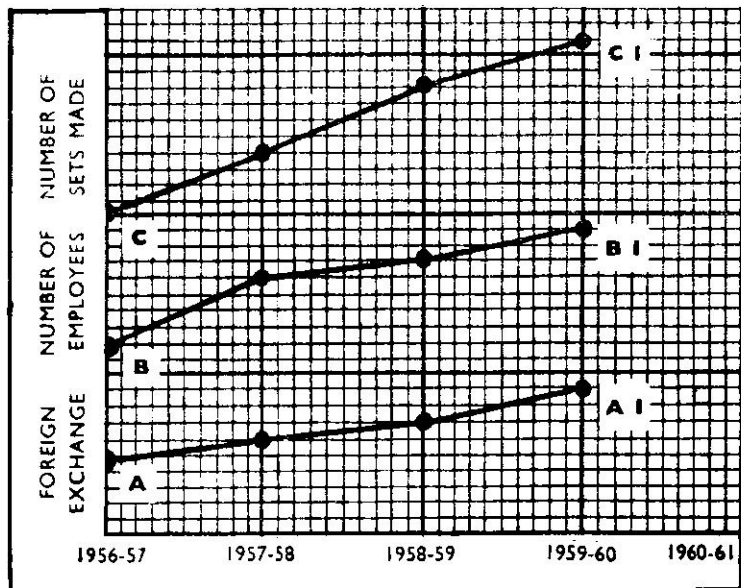
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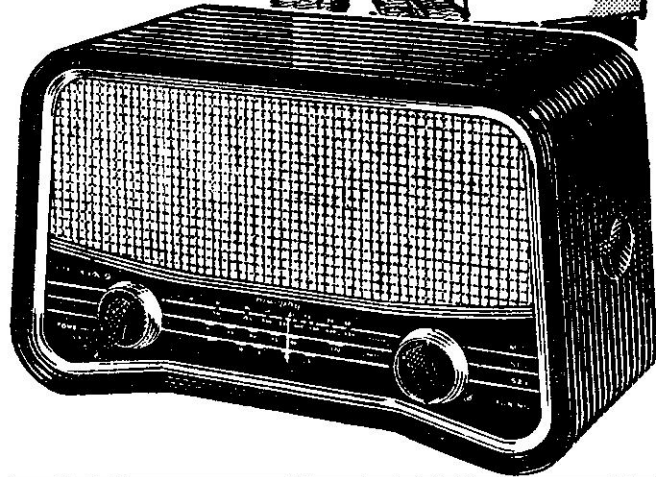
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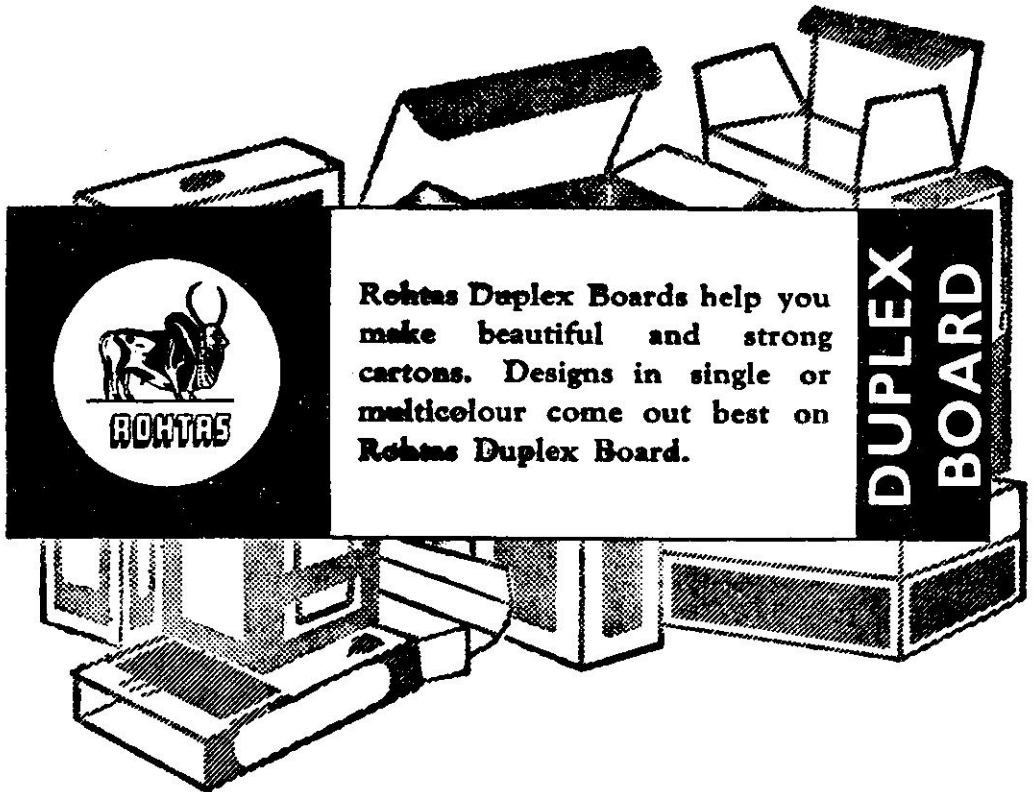


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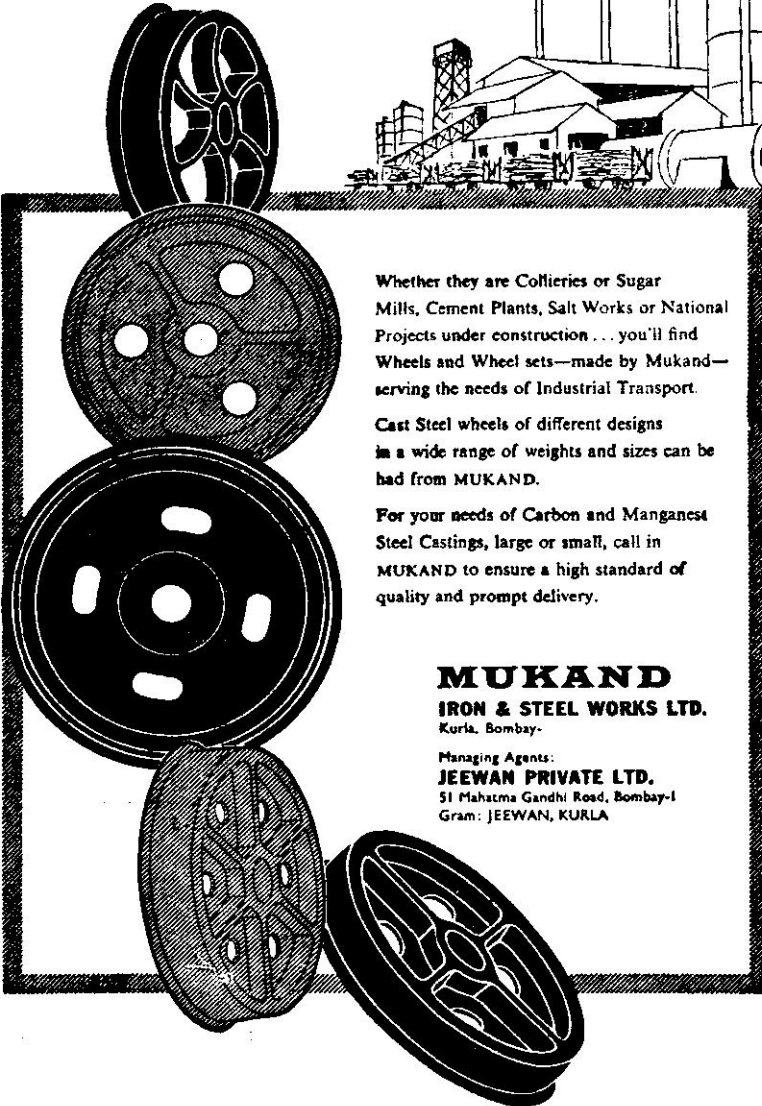
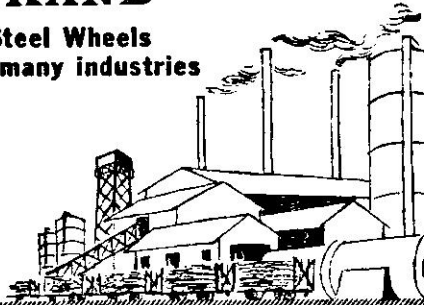
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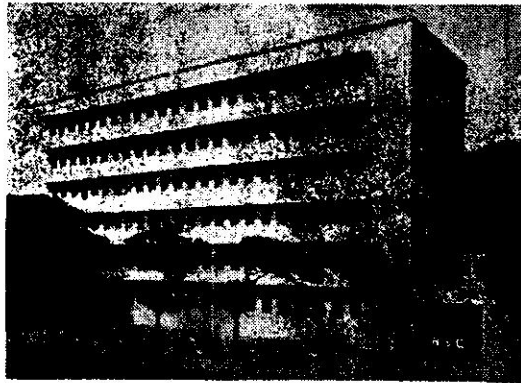
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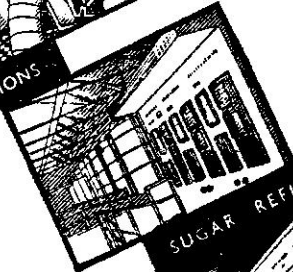
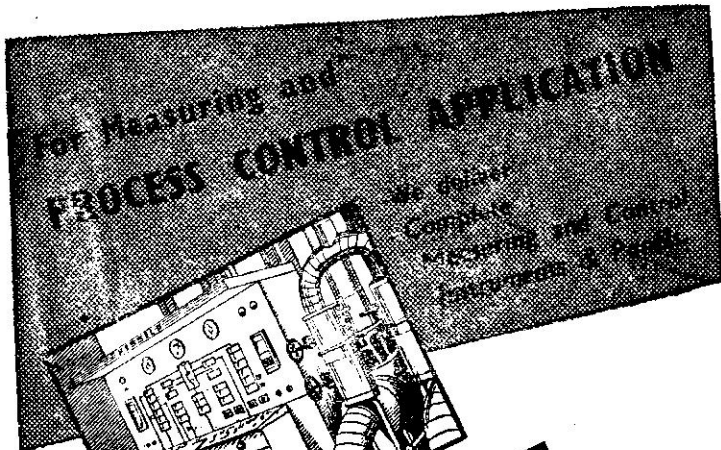
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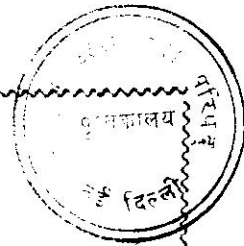
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