Vol. VIII, No. 2, Monsoon 1967 Editor: DH Butani

PRODUCTIVITY

NATIONAL PRODUCTIVITY COUNCIL JOURNAL

The Two Faces of Productivity

WHILE THE GOVERNMENT IS DOING ITS BEST TO KEEP THE ECONOMY MOVING ON AN EVEN KEEL and to manage a rather intractable price line, the resources position remains so tight that the Fourth Five Year Plan still remains to be born—awaiting irrigation from the monsoon. We thus face an economic situation which compels a choice between harsh alternatives; and those of us who are old enough may recall the Great Depression of the early thirties with its misery and mass unemployment: the other face of productivity, which happily the younger folks are not aware of.

The productivity that the post-war world knows of—or at least has heard of—is the productivity of an affluent society where full employment and fair wages have enabled the community to tap generally the talents and capabilities of the mass of men, such as we find it in the 700 billion dollar economy of the United States.

Yet not quite 40 years ago, following a collapse of the stock exchanges—known historically as the Wall Street Crash—many millions of people in the USA became unemployed, industrial bankruptcies mounted and farms in the countryside were going a-begging, for cultivators could not meet their current obligations.

This Depression had its repercussions in this country: grain piled up on farms and was freely offered at Rs. 2 a maund but there were no buyers! First class graduates could not get a teacher's job on Rs. 40 a month and one can recall the sight of young boys—graduates of universities, with portable typewriters hanging round their necks, barging into offices, saying: "Sir, Sir, I shall use my own typewriter; I shall use my own stationery; I can give tuition to your children; can you give me a job for Rs. 30 a month?" This too was productivity, for men were prepared to work

hard on bare subsistence but the employment potential of the country had collapsed and the society as a whole had become unproductive.

Statistically there was a tremendous increase in productivity of the individual firm and the individual farm, because factory managers and farm managers were cutting costs left and right, for there was no cash that they could give. The credit system had frozen (it will be recalled that there was a total closure of the banks even in the United States when Franklin Roosevelt became President of that country). Farmers were producing practically as much grain as before with the minimum cost. The output of factories did not go down materially but their wages bill was slashed, with the result that statistically there were in large areas, massive increases in productivity; but the products were unsaleable: with little employment, mass incomes had fallen and therefore demand for market goods was limited to the microscopic minority of rich people.

We have now to take a fundamental decision: is this the type of productivity we desire? It is true that a fall in prices is extremely desirable in the social interest. But a fall in prices can be brought about in two ways: one through a diminution of employment alongside a diminution of incomes, causing a fall in demand, leading to a fall in prices. A fall in prices can also be brought about through creating abundance by operating on the supply side of the economic equation through fuller utilisation of existing capacities both of men as well as of machines.

After all, when all is said and done, massive investments have taken place in many lines. During the last 16 years of economic development men have acquired skills. If there are 500 million mouths to feed, there are also a thousand million hands to work; or at least as many, if we take out the children and others disabled for reasons of age or sex. The most productive policy is, therefore, to put men to work to produce through their labour the food that people require and many other things which are in current demand.

What has happened to this country is nothing but what in law is called an Act of God. During the last four years we have had several misfortunes: the treacherous onslaught of the Chinese on our strategic frontiers; Pakistan followed, and then came drought for a number of years, the like of which we have not seen in the 20th century. All these together again have led to a considerable hardening of the foreign exchange position. But these enormous difficulties should on the contrary whip us into all manner of improvisation, import substitution, export promotion of all kinds, capacity utilisation, productivity promotion in all walks of life.

The difficulties that we face should not, of course, be minimised. During the last decade and a half of economic development, population has increased by nearly 140 million; and these people will now go on the labour market on a massive scale. We shall, therefore, be courting disaster, if we do anything to reduce the employment-creating potentialities of the economy. If, however, we do nothing else to make all this labour productive, other difficulties will arise of a rather serious character. Really the major cause of our difficulties has to be traced to the failure to formulate and to execute a productivity policy commensurate with the increase in employment and incomes. Commonsense, therefore, suggests that corrective action be taken along these lines, and not like the Chinese in Charles Lamb's story, we should burn

down the house in order to roast a pig!

There is another difficulty we ought not to minimise and that is the paramount need for security. From the time of Independence to around 1963 we went on the assumption that we would not be victims of external aggression and that we could devote a large part of our resources to economic development. That situation has changed and defence has by necessity become the highest priority of the State, and rightly so. The result has been an increase in defence expenditure from an annual outlay of Rs. 3,000 million before the Chinese aggression to about Rs. 10,000 million at an annual rate at the moment. Whatever economies we are able to secure, there is unlikely to be a material change in this order of magnitudes.

With so much of resources taken away by the imperative demands of possible external aggression and on that account, foreign resources for development remaining uncertain both in time and magnitude, we have to muster up all our latent resources to make the entire population a productive asset.

Broadly there are two approaches to the problem, one represented by the type of philosophy that Sri HVR Ienger, our former Chairman, has been preaching for quite some time. In this issue of the Journal we have reproduced *in extenso* in two different places what he said at the SITRA Conference on Human Relations and in the course of a talk delivered under the auspices of the Ahmedabad Management Association. He said, *inter alia:* "*...I do think that we are today on the eve of a breakthrough*, which will enable us in a few years' time—and not many years at that—to manufacture the bulk of the machinery and machine tools, heavy and light that we require..." Coming as it does from a man who spent several decades of his life in running the machinery of

...There can be no question that where human dignity or health is involved, materials handling must be mechanised. It is a matter of the utmost social urgency in order to attain the minimum levels of decency in a society patterned on the socialist model that the headload must give place to at least the wheeled trolley... The main point, however, is that a modern programme of materials handling might well mean a whole set of new industries coming into being. This could mean substantial employment for millions of people instead of slipshod, donkey work which would get us nowhere near the targets of industrial accomplishment, we have in view. The new Industrial Revolution would mean scales of output and employment, never dreamt of in the economic history of India...

From PRODUCTIVITY
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Also see Prof. Bruckart's article on page 230 of this Issue

Government—and who is certainly not uncritical of our faults and failures, it is our very considered opinion that we should develop our country along these lines, and *see the buoyant and not the depressed face of productivity*.

In this context we should not be unaware of the other point of view, for under the auspices of the Ahmedabad Management Association where Sri HVR Ienger spoke, there was another voice also heard: "If any Government is foolish enough to implement the Fourth Plan, we shall have to write on the gates of our economy the famous words of the Italian Poet: Abandon hope, all ye who enter here."*

This can easily be reduced to a *reductio ad absurdum*, for if we do not spend on the Fourth Plan Development Projects, we shall have to spend far larger amounts on keeping the people in order by force; and it requires no great wisdom to realise, considering all the political and economic circumstances, that massive unproductive expenditure will have to be incurred on internal law and order and external aggression. It would be the better part of wisdom to put the Fourth Plan through with whatever sacrifices it involves and to make the people productive through the development of capacities, contemplated in the Fourth Plan Draft.

For what after all is the Fourth Plan, except that in substance it means food for the people and work for the masses through production of additional equipment and facilities, and a little bit of a rise in the standard of living. At the moment the per capita daily income is around Re. 1: this is the average for all persons and if the Fourth Plan goes through it would be Re. 1.25 per person per day in 1971! That certainly is not a very heavenly objective and also one that is not unrealisable if we all put our shoulders to the wheel and make the system moving, instead of weeping and whining, and cursing God and Government.

This is no solution to the problem. There must be an intellectual and emotional awareness of realities: it requires no more than a very elementary knowledge of economics to realise that historically, high taxes, high prices, high rates of capital formation, high levels of output, high employment, high wages, high productivity: all these have gone together, and on the other hand, low taxes, low profits, low wages, low employment, low capital formation, low prices, low output: all go together. We have to make a choice. It would in any case be preferable to have high employment and high prices rather than little employment and low prices.

Translated into productivity terms we can have a situation where the level of employment falls faster than the level of output, with resulting statistical increase in productivity! We can also have a situation with both employment and output rising but the employment rising faster than output, with the result that there is a statistical decline in productivity. Would it be preferable for us to have falling employment with falling output, or rising employment and rising output? If we rule out falling employment and falling output as a wholly undesirable alternative, and opt for a policy where both output and employment increase, this does not mean that we minimise the resulting difficulties, which exhibit themselves in a state of rising prices.

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* *Management of Plans*, published by the Ahmedabad Management Association, p. 139

Here again the solution appears simple but unfortunately not quite acceptable, namely, that in these circumstances Government should be able to syphon off the additional purchasing power through higher taxation; and in effect the people would be better off. In considering the last 10-15 years, while we have been reluctant to pay, say, Rs. 50 by way of additional taxation on a family, each family has willy nilly parted with several hundreds of rupees to hoarders and profiteers. If the price of wheat rises by Rs. 5 per maund and a family consumes a maund per month, in effect the family is paying a tax of Rs. 60 to the trader whereas probably an additional government tax of Rs. 10 per family might well have prevented that rise of Rs. 5 in the price of wheat. On balance, therefore, the payment of Rs. 10 as tax to Government might well have saved Rs. 60 being taxed by the trader for wheat alone.

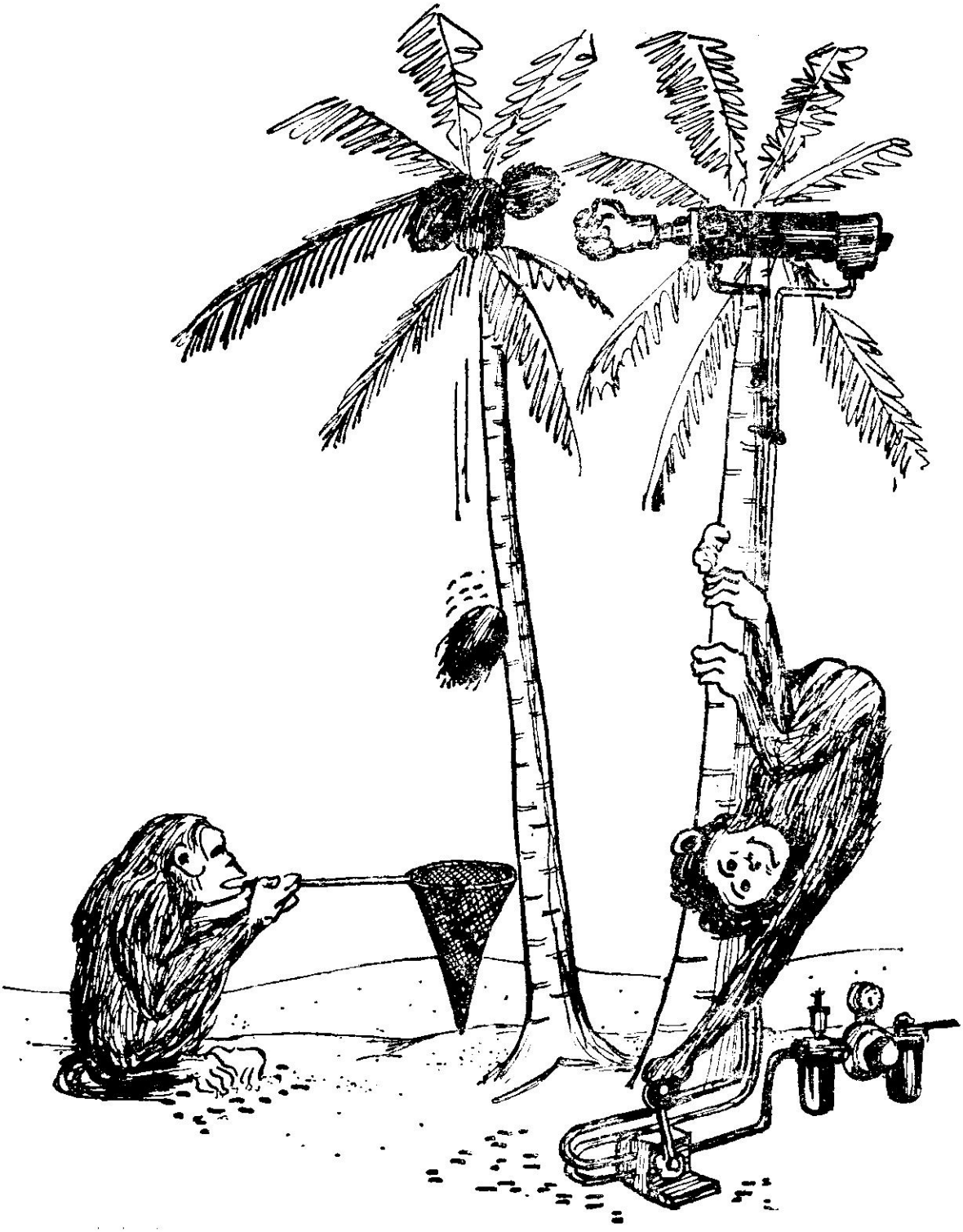
These, however, are normal difficulties experienced in any developing economy. We in India do not suffer from an excessive ignorance of economics or of the laws of social change. Really, there is the more optimistic side. The people after having been liberated from several centuries of foreign misrule are beginning to feel to be their own masters. We desire to have quickly the good things of life and have rather been slow to realise that all these additional capacities have to be paid for. If Government has to spend hugely on defence and if government and private enterpreneurs spend equally hugely on development, on investment in transport and electrification, and in factories and on farms, and if people also begin to spend on an equal scale, the result would be a volume of expenditure which this adolescent economy can hardly bear. All this requires a little understanding and adjustment, certainly not an over-all contraction of the economy.

The future really is bright as Sri HVR Iengar said, quoting again from the same source: "...I have enough faith in the vitality of our people to believe...that from within the present confusion and sense of frustration we will emerge on a plateau of high and sustained endeavour...Historically we have again and again risen from chaos to great heights. There is no reason why we should not do so again."

On the broad national plane these words were heard many many years ago from Swami Vivekananda and later from Mahatma Gandhi; and these words will come true, if our minds are inclined to *that face of productivity, which indicates work for all, food for all, some good things of life for all our people; and we turn away from that face of productivity, associated with retrenchment, Gheraos, and no planning.*

These make no sense, when the paramount call of the hour is to put men and women to work and to get the best out of them by all sorts of adjustments and compromises, whether they are socialistic or capitalistic or co-operative, for our only ideology is productivity—*real, social productivity, which means the good of all.* It has to be carefully planned and vigorously executed. It will not fall from heaven, for God's productivity exhibits itself through man's productivity, and whole civilisations have disappeared because they got on the falling curve of productivity, and civilisations have risen and flourished when they got on the rising curve of productivity. Our philosophy, our literature and arts have now the best chance, if with planned and sustained effort, we get on to the rising curve of productivity to the point of take off ●

"When there is no vision, the people perish".



CR WYNNE-ROBERTS

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Anatomy of an Industrial Enterprise

IF ONE WERE TO ASK THE QUESTION: "WHERE is the largest single body of managers in the world to be found?", the answer would unquestionably be: "Among the housewives of the world." This may, at first sight, be a little galling to male vanity, but a very little thought will show that it is true. If we consider for a moment, we shall realise that the housewife, in fact, carries out all the major functions of management with the possible exception of marketing—in some cases she also does that. In fact, the old-fashioned housewife running a large household did a major job of management and, although large households with many children and servants are tending all the time to diminish, there are still many women who are doing such jobs today and doing them well.

Consider what the woman managing a large household has to do. She certainly does purchasing, she certainly manages the production of meals, sometimes of clothes, the operations of cleaning, storekeeping and stock control, maintenance and a great deal of personnel management of her children, of the servants and, *generally, of her husband, although, if she is clever he will never know.* She does financial management, often with great skill, and housewives have been operating budgetary control centuries before the term was ever heard of in industry. In some countries, England, for example, farmers' wives have traditionally had the job of tending the poultry and marketing the eggs. There are, of course, good housewives and bad housewives, but *if the average housewife ran her household as inefficiently as some husbands run their businesses, the latter would be the first to complain.*

It would be stupid to suppose that the average woman is less intelligent than her husband but, even in this modern world, she is rarely as well educated. *Why, then, do women often seem to make a better job of managing their "enterprises" than men do their businesses?*

The Industrial Enterprise—A Complex Organism

The most probable answer seems to be that even a large household is still a comparatively simple entity compared with any but the very simplest industrial undertaking. The relative inefficiency of so many industrial

enterprises may well be due to the fact that *few managers really understand the nature of their enterprises*,—the close interdependence of all the activities in them, and the very large number of factors, internal and external, which have to be taken into account if they are to operate at a really high level of efficiency. This is probably because very few industrial managers have the time or the opportunity to sit back and examine their enterprises as a whole and to study all the factors which affect their operation.

Let us, therefore, consider in the brief compass of this article, the anatomy of a modern industrial undertaking. I shall take, as an example, a manufacturing undertaking, but practically everything that is said may be applied, with only minor modifications, to enterprises in the service industries, transport and so on. In order to do so I shall present what is, in effect, a stylised picture of the enterprise. There are, no doubt, many ways in which such a picture could be presented; this is simply one of them, but I believe it to be a reasonably accurate one.

Operational Activities

Figure I shows a highly stylised picture of a manufacturing enterprise. It will be seen to be composed of

1. A set of "Operational Activities" which form what might be called the "core" of the business;
2. A "Financial Frame" within which this core is located;

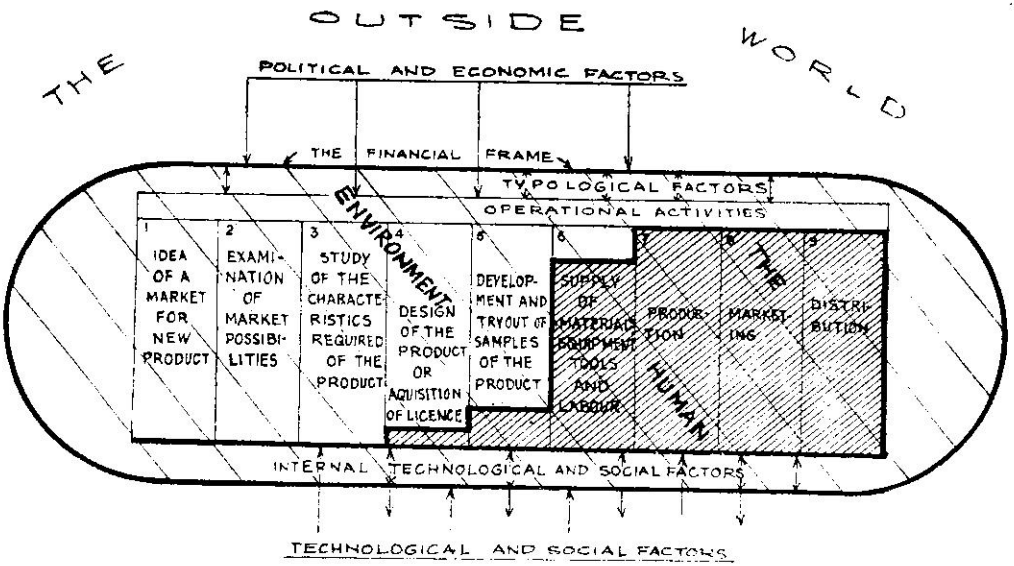

Fig. I. Diagrammatic view of an Industrial Enterprise.

The varying heights of shaded portions of various operational activities denote the extent of these activities for the current products of the enterprise at a given moment. This undertaking is not currently launching any new product. Thus the first three activities are nil. Some design work is still being done and some development. The products are in full production and getting fully marketed and distributed.

3. The "Human Environment" which pervades all the activities, including even the financial ones.

In addition, there are a number of "factors" which operate on the operational activities, on the financial frame and on the human environment both from within the enterprise and from the world outside it. These factors tend to modify favourably or unfavourably at different times the operation of the business as a whole and at times one or more of them may act as major restrictions on the development or operation of the business, even to the point of forcing it to close down. Let us examine them in greater detail.

The operational activities of an enterprise are those activities which directly further the economic ends for which the enterprise exists and without which the enterprise would not produce or operate anything, even though finance and personnel were available to do so. All managerial, financial and personnel activities are directed to the furthering of these operational activities in that particular business and may thus be considered auxiliary to them. What are they ?

Marketing

All these operations must start with an idea, and this idea is as much a part of these activities as the more concrete productive or marketing activities to which it eventually leads. The owner or the manager of a business has an idea that there is a good market for a given product or the need for a particular service. At this stage it is only an idea; before it can be more, some steps have to be taken to find out whether this idea was, in fact, a good one or not. Some sort of an effort has to be made to find out whether in fact an adequate market for such a product does exist which would make it profitable to manufacture and sell or whether, in the case of a public undertaking, for example, a demand for a service is sufficiently large to justify putting one on.

Assuming that, as a result of some sort of study, detailed or superficial, a market is found to exist, the next step is to find out as accurately as possible what sort of a product the prospective purchasers want, its performance, appearance, price and other characteristics. Once a reasonably clear idea has been obtained of what is likely to sell, the next step is either to design such a product (or work out the specifications of a service) or, if this is more practical, to obtain a licence to manufacture a product already designed by someone else and which is selling successfully, perhaps in another country. It is generally desirable before launching into full scale manufacture, to make a few samples of the product in order to try it out as to performance and acceptability and, in particular, to ensure that it is designed in such a way as to be manufactured as economically as possible. Once the manufacturer is satisfied on this point he can go ahead and order the raw materials, tools and machinery necessary and to take on any labour he may require in order to make it.

The product now goes into the production stage (or in the case of, say, a transport service, into operation) and the raw material is transformed into the finished product. While this is going on, the marketing process starts so that the products may be disposed of as quickly as possible on completion and money returned to the enterprise. This selling process may involve advertising, sales promotion and other means to ensure that customers buy the products. Finally the products are distributed to the customers, who may be wholesalers, industrial retailers or the consuming public.

It will be clear that in the case of any one particular product the earlier activities will eventually taper off and die away completely as the product becomes stabilised in design or specification, leaving only the last four activities in full operation. In a firm which has diverse lines of activities, new products may be in the development or even less advanced stage, while others are in full production, so that all these activities

may, in practice, be going on simultaneously, but for different products or services.

Economic Production

Before leaving the operational activities, it may be well to underline that the various stages of activity are generally closely interdependent. Thus economic production depends upon good design and development and upon supplies of the right quantities and qualities of raw materials at the right times as well as of the right types of plant and equipment *and men with the right sorts of skill.* Similarly, effective selling must depend on the delivery at the right time of products of the right quality and price, the latter a function of economy of production. The study of the interdependence of all these activities is, in itself, often a complex matter and cannot be dealt with further in this article.

It will be seen that the operational activities do not exist in a vacuum. In the first place they exist within a frame of finance which determines, to a large extent, their volume and effectiveness. Where the firm has ample financial resources the operational activities may be carried on under the most favourable conditions by means of, for example, the most up-to-date plant and equipment factors, such as the supply of raw materials or labour will allow. Where, however, the financial means of the enterprise are restricted, the operational activities may be restricted, and if it proves impossible to expand the financial frame by acquiring additional finance or to reduce the cost of the activities by improving their efficiency, these activities will be hampered and in the extreme case may be forced to stop altogether, so forcing a closing down of the enterprise. It will thus be seen that *the operational activities and the financial frame exercise on one another a constant pressure, feeble where finance is ample for the operational needs, strong where finance is restricted.*

Everything that happens in an enterprise is the result, ultimately of human actions, human decisions and the interplay between different human beings, who form the personnel of the enterprise, from owner or manager to the humblest labourer. All the operational activities are dependent for their performance on the abilities and capacity to work together of the people concerned in them. The success with which the financial frame of the enterprise is manipulated depends on the judgment and ability and, sometimes, the reputations for integrity of the people, generally the owner, directors, managers and accountants concerned with it. Every decision, or action taken affects, in some measure, people in the enteprise, and is, to some extent, affected by them. Thus we may say that *this human environment is all-pervading* and, in fact, extends its influence at times beyond the confines of the business itself.

External and Internal Factors

There are a number of factors both outside the enterprise and within it which may affect its operation, sometimes drastically, and which may, at any given time, limit the scope of its activity, more than, say the financial frame. For the sake of illustration these factors may be divided into two :

EXTERNAL

- Political
- Economic
- Technological
- Social

INTERNAL

- Typological
- Technological
- Social

A brief survey of the nature of these factors and the sort of effects which they may produce will serve to indicate their nature.

The enterprise has to exist in the context of the nation in which it finds itself and of

the larger international world beyond. Depending on the nature of its products or services it will be more or less affected by the policies of the government of the day towards private enterprise, whether it is encouraged, or penalised, by its policies towards labour, the location of industry, employment of any particular social group, nationality or race. In the economic field the general economic situation of the country and sometimes of other countries, availability of foreign exchange, possibilities of obtaining raw material or machinery from abroad as well as the available purchasing power for its products may all represent important limiting or encouraging influences on the progress of the undertaking. Since politics and economics often go hand in hand, taxation policies and protective action taken by the government may either curb or enlarge the activities of the enterprise. A diagrammatic illustration of external factors such as the inability to obtain raw materials or appropriate machinery, imposing a restrictive effect on specific activities, is shown in Figure II.

The progress of the undertaking may be equally influenced by the technological field in which it operates. If the technology is one constantly undergoing new developments, as, for example, in the electronics and plastics fields, whether as to product or process, the business may find itself forced to spend a great deal of money in renewing its processes and bringing them up-to-date or in developing new products in order to keep up with its competitors. If, however, it operates in a field where the technology is simple and stable, the influence of this factor may be unimportant and the economic factor of markets and purchasing power may predominate. Finally, there is the social factor. Just as the individual human factor pervades

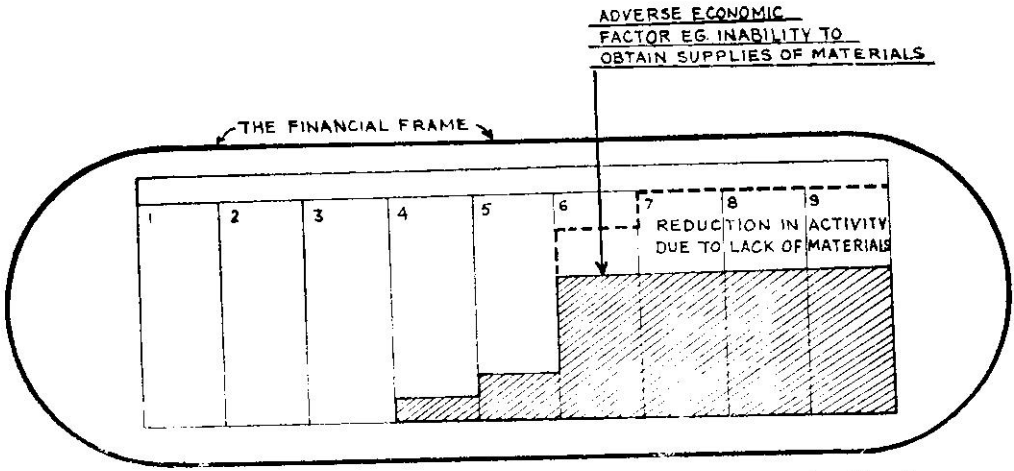

Fig. II Reduction in Production, Marketing and Distribution

(due to adverse external economic factor, e.g., inability to obtain adequate supplies of materials due to import restrictions)

This diagram represents the same moment in the life of the enterprise as Fig. I. The financial frame is still not exerting any more pressure on the operational activities than in Fig. I. The restriction on output is due entirely to the single external factor of being unable to obtain sufficient materials to enable full production to be maintained. At any given time several external or internal factors may exert a restrictive effect or an expansive one. These effects, if prolonged, will affect the finances of the undertaking, adversely or otherwise.

the whole enterprise in all its activities, so the enterprise has to live and operate in a social environment. This social environment, which is the environment from which it draws its personnel, may contain factors which are favourable or unfavourable to effective industrial operation. For example, *an environment in which the industrialist is looked down upon, or manual work is despised, or in which the sources of personnel are primarily non-industrial, will likely affect adversely the efficiency of the enterprise and will have to be counteracted.* Equally, a society in which the possession of material goods is socially important may be likely to encourage its growth.

The above examples of the external influences on the operation of an industrial undertaking are, of course, far from exhaustive. The reader can, no doubt, think of many more. Nor are the influences all one way. The enterprise, in its turn, may exert a greater or less influence on the world around it. This may be international, national or local depending on the importance of the undertaking in the economic field, its degree of development and its policies. A large and powerful enterprise exercising a virtual monopoly may be able to influence government policies in its favour. A firm in the van of technological achievement may force its competitors to follow its lead. Even quite a small business, located in an agricultural community, especially where there is no other industry at all, may profoundly modify the social outlook and behaviour of that community, as well as having an important economic influence on it.

Of the factors internal to the enterprise which may influence its operation and especially the way in which it is managed the typological factor is often a most important one. By this is meant what type of enterprise it is: Is it manufacturing or primarily marketing? Does it make goods for stock or only to order? Does it make for industry or for the private consumer? Closely linked with this is the technological factor: Is the product technically complex or simple? Does it demand highly qualified design staff? Is the process one demanding highly qualified or highly skilled personnel or is it a very simple one? Is it capital intensive or labour intensive? Are the product and process rapidly evolving or static?

The social factor also operates within the enterprise as part of the human environment: Are people of different races or religions employed? Is there a tendency to maintain traditional relationships established outside the enterprise inside it? Are there problems of certain groups working together? Are supervisors and workers all drawn from the same sort of background?

It will be seen from this very brief survey that the industrial enterprise is indeed a very complex thing demanding very deep study if it is to be properly understood and its operation is to be really effective. Furthermore, it operates in *time* and conditions are never static. The head of such an enterprise may have specialists to advise him in many fields, but he is the man who must be aware of these many factors and of the essential nature of his undertaking so that he can determine accurately at any given moment which aspects of operation are important and which factors, external or internal, must be combatted in case they should detract from its successful operation or which factors encouraged, if they are favourable, in order to improve the standing of the enterprise. He must further be able to guide his specialists in order to ensure that they deploy their efforts in the right directions.

Conclusion

There is one special feature to which I should like to draw attention once more. This is the high degree of interdependence of everything connected with an industrial enterprise, operational activities, finance, external and internal factors, and the human factor. It is because of this interaction in which no action can be taken in one sector without immediately affecting, to a greater or less degree, all others which makes the

management of an enterprise a matter for such constant vigilance and awareness on the part of all those concerned in it. In effect, *the industrial undertaking is an organism, in this respect, closely akin to a living organism; when one part is affected, the whole is affected.* It is for this reason that the use of the word "anatomy" in the title of this article is not misplaced. Within this organism, management represents the brain which must take the major decisions, while the nervous system is represented by means of communication, operating, of course, in both directions, between the management and all the other personnel in the enterprise. Among human beings, it is the man who understands best the possibilities and limitations of his body and who knows the effect which external or internal factors are likely to have on his health and well-being and who has, in addition, a sound and quick-reacting nervous system who is likely best to survive and prosper in life. In just the same way, the manager who understands thoroughly the nature of his business, its possibilities and limitations and all the factors which can affect its operation, so that he can take steps to offset the effects of unfavourable conditions and circumstances and take advantage of favourable ones, is the one whose enterprise will develop and flourish.

Beauty and the Export Drive

It was refreshing to hear the Chairman of the State Trading Corporation say the other day that his objective was that Indian wigs adorn the heads of all the beautiful women in the world who wield power. This showed imaginative salesmanship. If the Indian goods, howsoever small, can capture the hearts and minds of influential people abroad, half the battle of exports will have been won.

In the general scramble for exporting more "raw materials" in their raw form and machinery in its strictly utilitarian form, we tend to forget that "*beauty*" *perhaps is still the largest single exchange earner in the world.* Good films and works of art, handicrafts, tourism, attractive fabrics and scores of other articles of daily use are usually sold more for their beauty than for their durability or any other quality.

Japan, France, Italy and several other exporters of small items seem to have realised this truth which we once knew and now seem to have forgotten. Unconsciously tourists seem to be drawn to lands where the women are beautiful and kind and the view is sublime. They prefer airlines with charming hostesses. They enter shops whose inside is inviting.

Yet beauty, the most sought after commodity, is for every country a native product. It needs little foreign exchange or costly imported equipment to impart a distinctive flavour of Indian beauty to an Indian product. Only it needs a lot of effort which will doubtless need some extra rupee resources. But more than rupees it will need skill, ingenuity and a national determination not to export any consumer commodity that is not beautiful too.

From *THE CAPITAL* dated 25 July 67

JYOTIRMOY BANERJEE

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Importance of Learning Curve in Industry

This is an original research piece, seeking to establish a continuous increase in productivity as a job is being learnt; and as the learning process is endless, productivity is not a static phenomenon. The learning curve shows the nature of improvement in the productivity of a worker, a group of workers, or a whole organisation. The pattern is so regular that it is possible to forecast the labour loads, plan delivery schedules, set selling prices, and have more effective control on cost with the new tool. This paper works out a mathematical and graphical approach to the problems of a typical firm in an expanding economy, illustrating with examples as to how the learning curve can be utilised in various industries.

DURING WORLD WAR II, A REMARKABLE phenomenon was consistently observed in the aircraft industry: *the direct labour input per airplane declined with considerable regularity* as the cumulative number of planes went up. It became obvious that the operators learnt as they went through the operations, acquiring more and more skill through better eye-hand co-ordination; the required muscular movements control became more automatic; and there was better understanding among fellow workers. *The level of skill rose like a curve, strengthened in its upward movement by increasing harmony, physical and psychological.* The phenomenon recurred for every new plane that was made; and as such it was referred to as 'Learning', rather than as 'Productivity', which has its own connotation.

It became very conspicuous, for it meant a progressive decline in unit cost; and more planes could be produced with the same work force and facilities. Various airframe companies soon established certain standards of learning which they used as a basis of predicting direct labour input. The U.S. Armed Forces became interested and sponsored a statistical study at the Stanford Research Institute, covering a majority of all aircrafts produced during the war. A

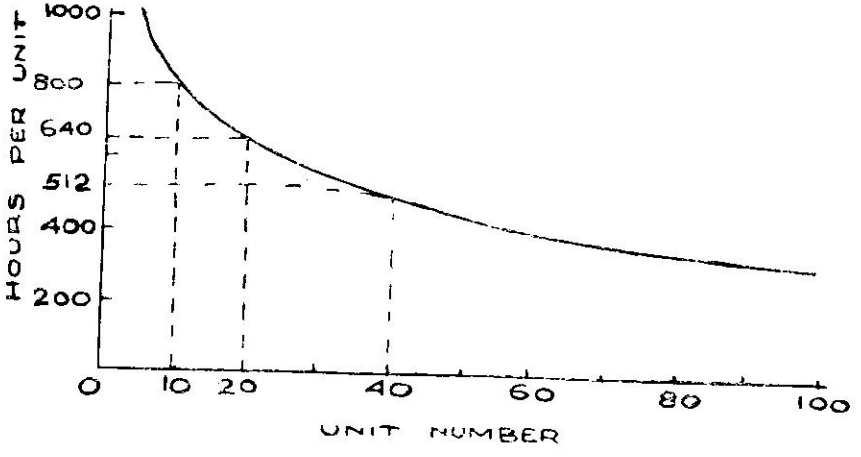


FIG. 1 LEARNING CURVE

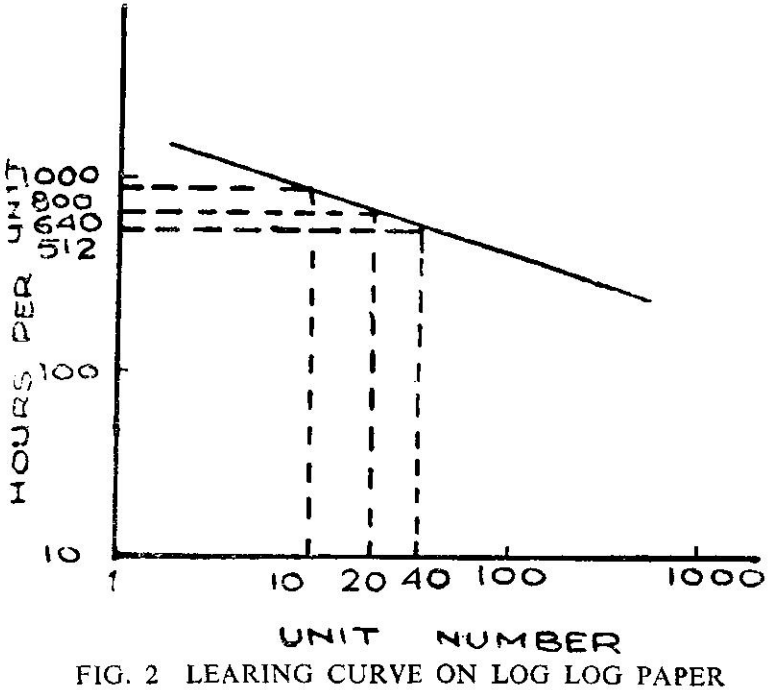


FIG. 2 LEARING CURVE ON LOG LOG PAPER

series of learning curves for the different categories of airframes was developed on log log paper for the total hours per unit against the number of units produced: it was found that these curves differed at the starting point but had the same slope; that is, their rate of improvement was common. The latter when expressed as a percentage between double quantities of production was found to be 80%, and was more generally known as "Curtiss 80% curve".

The significant fact is that the rate of improvement is regular enough to be predictable. This holds true whether the industry is aircraft, metal working, textile or candy-making. Figure 1 shows a learning curve on arithmetic graph paper that decreases continuously till a certain 'plateau' of efficiency is reached. When more conveniently plotted on log log paper (Fig. 2) it becomes a straight line. The same can be extended further to predict the unit labour hours for future production.

Mathematical Analysis

With the help of these curves, it has thus been made possible for a manufacturing company to accurately predict the cost per unit of product; set selling prices; plan delivery schedules; forecast capital and labour needs; measure shop efficiency; set standards and pay incentives on increased efficiency; and check the subcontractor's bids for accuracy and reasonableness. Further, it would enable one to know the cumulative average time for a particular unit number, and the cumulative total time from the beginning. Normally, the three curves (unit cost, cumulative average and cumulative total) will not give straight lines on log paper; as such it is usual to assume that the cumulative average values follow a straight line (Fig. 3). The latter can be expressed mathematically in the form $y = c.x^{-\lambda}$ with a high degree of significance. Other values may be developed in the following manner:

Let x = Any unit number of the abscissa

x_p = Unit number, P

x_q = Unit number, Q

l_x = Direct labour for any unit, x

l_1 = Direct labour time for unit number 1

T_x = Cumulative total time through any unit, x

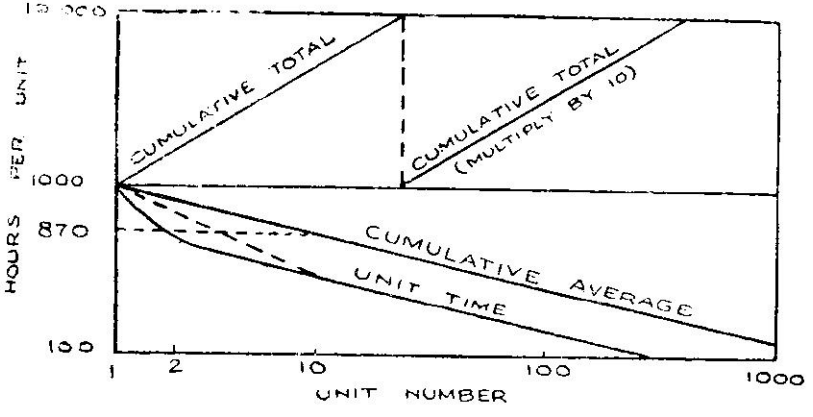


FIG. 3 UNIT, CUMULATIVE AVERAGE & CUM. TOTAL CURVES

A_x = Cumulative average time at any unit, x
$= cx^{-\lambda}$

λ = Slope (tangent) of the learning curve on log log paper

(1) Cumulative average time for unit number 1,
$= A_1 = l_1 = C.1^{-\lambda} = C$
or $l_1 = C = A_x.x^{\lambda}$ .. (1)

(2) Cumulative average time at unit x,
$A_x = l_1 x^{-\lambda}$ ...(2)

(3) Cumulative total time through unit x,
$T_x = x.A_x$.
or $T_x = l_1.x^{(1-\lambda)}$ ...(3)

(4) Individual unit time at unit x,
$l_x = l_1 \left[x^{(1-\lambda)} - (x-1)^{(1-\lambda)}\right]$ ...(4)

(5) Approx. time for single unit x (>10)
$l_x = l_1.\left[x^{(1-\lambda)} - (x-1)^{(1-\lambda)}\right]$
$= l_1.x^{(1-\lambda)}\left[1-(1-\frac{1}{x})^{(1-\lambda)}\right]$
$= \frac{t_1(1-\lambda)}{x^{\lambda}}$, by expansion,
or $l_x = (1-\lambda).A_x$ ... ...(5)

The same equation can be rewritten as follows:—

$$l_x = l_1\left[(x-\tfrac{1}{2}+\tfrac{1}{2})^{(1-\lambda)} - (x-\tfrac{1}{2}-\tfrac{1}{2})^{(1-\lambda)}\right]$$
$$= l_1.(x-\tfrac{1}{2})^{(1-\lambda)}\left[\left\{1+\frac{1}{2(x-\frac{1}{2})}\right\}^{(1-\lambda)} - \left\{1-\frac{1}{2(x-\frac{1}{2})}\right\}^{(1-\lambda)}\right]$$

or $l_x = \frac{l_1(1-\lambda)}{(x-\frac{1}{2})^{(1-\lambda)}}$, by expansion... (6)

The latter equation gives a closer approximation to l_x when $x \leqslant 10$

(6) Total time for a group of units (unit P through Q),
$\Sigma T_{xP\to Q} = l_1\left[x_q^{(1-\lambda)} - (x_p-1)^{(1-\lambda)}\right]$...(7)

(7) Cumulative average time for a group of units 'P' through 'Q',
$$A_{xP\to Q} = \frac{l_1}{x_Q - x_P + 1}\left[x_Q^{(1-\lambda)} - (x_P-1)^{(1-\lambda)}\right] \quad ...(8)$$

(8) Slope λ, from two values of A_P and A_Q
$$\lambda = \frac{\log A_P - \log A_Q}{\log x_Q - \log x_P}$$
$$= \frac{\log \frac{A_P}{A_Q}}{\log \frac{x_Q}{x_P}}$$
$$\text{or } \lambda = \frac{\log \frac{100}{a}}{\log 2} \quad .....(9)$$

Learning Curve Ratio (L.C.R.)

The slope of the learning curve is usually termed as the 'Learning Curve Ratio' which is the ratio 'expressed in percentage' of labour hour for twice any unit to the value for that unit,

$$L.C.R. = \frac{t_2}{t_1} = \frac{t_4}{t_2} = \frac{t_6}{t_3} \quad ... \quad ...(10)$$

The values for typical operations are indicated below:

For completely automatic work,
L.C.R. = 100%

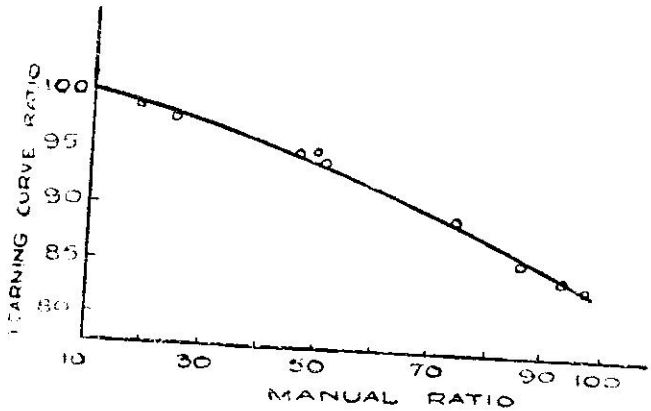


FIG 4 CORRELATION CURVE (M.S. TITLEMAN)

For Punch Press Operations, L.C.R.=90%

For assembly work, L.C.R.=70% to 80%

A slope below 60% is rare and should be looked upon with doubt, because a 50% curve is absurd.

M.S. Titleman (1957), in his studies on the various operations in a steel fabricating plant, has shown that the proportion of manual elements in an operation affects the 'degree' of learning, and a good correlation (Fig 4) exists between the manual ratio (M.R) and the Learning Curve Ratio (L.C.R.). Small variations in manual ratio may occur in a particular operation as learning takes place. Under such circumstances, a useful manual ratio is obtained by reference to previous time study records of similar operations or from standard data systems.

The correlation curve between L.C.R. and M.R. can be effectively used in determining the combined L.C.R. of all operations required for the manufacture of a product.

If P=Total effective L.C.R. for a unit or product %

X=% of the job represented by each operation

Y=L.C.R. for each operation obtained from the correlation curve (L.C.R. vs. M.R.) %:

$$P=X_1Y_1+X_2Y_2+X_3Y_{3+}\ldots \qquad \ldots(11)$$

Pitfalls

It must, however, be noted that the increase in manufacturing efficiency as reflected in the learning curve does not result only from the increasing efficiency of the direct worker but also from other associated developments, such as better planning on the part of the shop foreman, continued improvement of tools, simplification of engineering designs etc. It is the cumulative result of the all out effort of a particular group responsible for the manufacture. However, no sure-fire accuracy is

obtained by the application of the learning curve to a particular problem unless it is carefully applied and hazards avoided. The common pitfalls in the process are:

(a) False labour savings by purchasing raw materials in finished form rather than continuing the manufacture in one's own shop. The decline in the curve should be shown on the basis of the total reduction in labour input, including those wherefrom the materials are obtained;

(b) Reshuffling in direct labour (tooling and supervision) which affects labour input;

(c) Changing the labour 'mix' or reorganising the work force in a more effective manner;

(d) Extension of the curve for the second contract when there is a sufficient break in the period between the two contracts of the same type. The learning curve tends to revert to approximately the starting point every time a break occurs.

(e) Wilful control of production by labour. It is common experience that the workers decide amongst themselves the production level per day, and wilfully control the level of output, even with incentives. (See Fig. 5).

Controlling Factors

The usefulness of the learning curve depends on several factors, a few of which are mentioned below :

(a) *Product Innovations :* The concept of 'learning' assists in accurate forecasts of direct labour time in cases where design changes are frequent, new products are introduced, or in the case of short-run manufactures at well separated intervals.

(b) *Manual Ratio :* The effect of learning is more prominent in assembly lines than in machine shops, where greater proportion of time is taken by the machine itself.

(c) *Advance Planning :* A systematic planning in advance, particularly on methods and tooling, leads to a uniform learning curve, as against a 'jirky' curve.

Applications

The concept of the learning curve has been extended beyond the aircraft industry, and can be usefully employed in long, complicated assembly lines in electronics, manufacture of home appliances, light machining, textile industries and in larger projects like building contracts and ship building. The

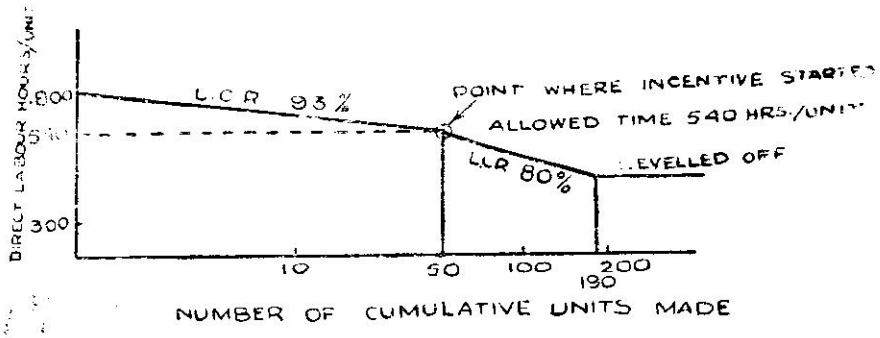


FIG. 5 PRACTICAL LEARNING CURVE SHOWING LEVELLING OFF

following are a few examples that illustrate the applications.

Predicting Direct Labour, Accurate Pricing, etc : From actual assembly line the number of hours required to produce the first ten units are known, say 10,000 hours and L.C.R. is estimated to be 80% from the nature of the assembly. It is required to know as to how much time would the 100th unit take during assembly.

$$\text{U.C.A. for 10 units} = \frac{10{,}000}{10}$$
$$= 1000 \text{ hrs.}$$
$$\text{U.C.A. for 20 units} = 0.80 \times 1000$$
$$= 800 \text{ hrs.}$$
$$\therefore \text{ U.C.A. for 100 units from graph} = 470 \text{ hrs.}$$
$$\therefore \text{ Time required to produce the 100th Unit} = 1-\lambda \times 470$$
$$= 0.6781 \times 470$$
$$= 318 \text{ hrs.}$$

In another case, the record of actual learning curve showed several hunches and the values were below the standard (80%) obtained from previous statistical data (Fig. 6). The manufacturer completed unit No. 200 at a unit labour cost of 2.4 hrs/lb. when he received a fresh order for additional 300 assembly.

Weight of each assembly is 8000 lbs.

According to standard, average hours for additional 300 parts $= 2.0 \times 8000$
$= 16{,}000$ hrs ... ... (12)

The actual learner's curve was extended by a line parallel to 80%.

$\therefore$ Average for additional 300 units
$= 1.71 \times 8000$
$= 13{,}680$ hrs ... ... (13)

The latter figure was more reliable than (12).

Setting a Standard Before the Operator has Finally Mastered the Job : It involves a definite time for a normal operator to acquire skill on a particular job. If a standard is set with current time study, the values soon go out of line. The problem for the management is to know the ultimate incentive production standard and the time for an average experienced operator to come

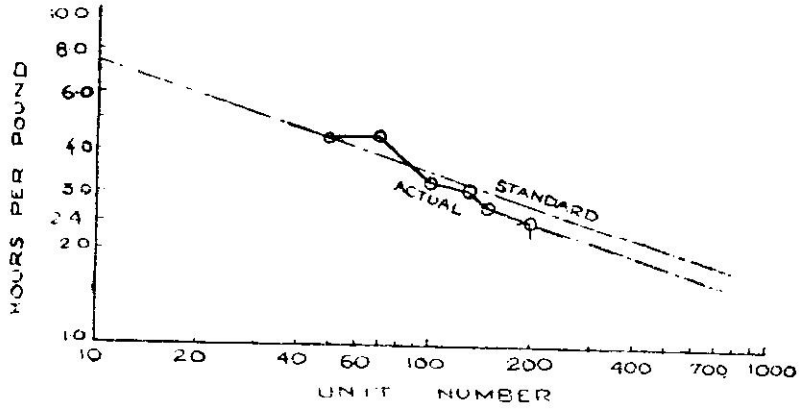


FIG 6 UNIT CURVES : ACTUAL & STANDARD

up to that standard. This may be obtained by actual learner's curve as shown in Figs. 7 and 8. The standard of 120 hrs/unit is set from the cumulative curve line when the total number of units on order is 100,000.

On setting the standard, the operator is guaranteed his base rate of pay during the learning period, till he is able to meet the standard (at A): the operator is paid a learner's allowance over the amount he is actually performing. The operator after meeting the standard is left on his own. During the learning period the company is absorbing the loss, which is offset by a net gain in the latter part of production.

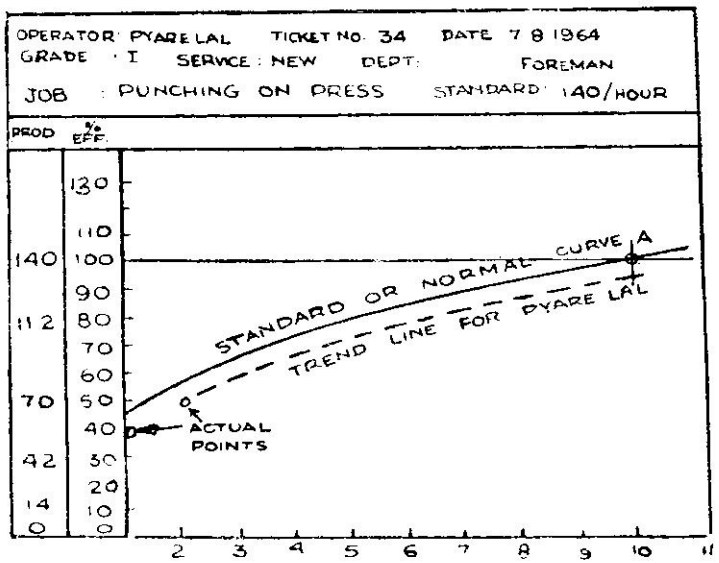


FIG 7 LEARNER CARD

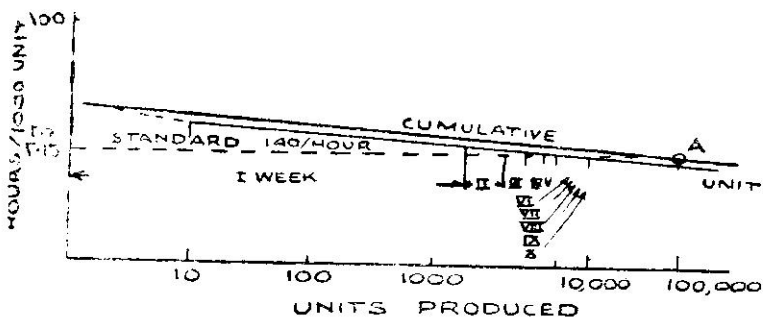


FIG. 8 SETTING STANDARD ON 100,000 POINT

Projecting Labour Loads and Planning Schedule : In the example with which this article began, the schedule of airplanes in different months was fixed according to the requirement of Air Force. It was required to estimate the labour load in each month and decide on the hiring plan of direct labour (illustrated in Table I). Departmental loads can be similarly plotted, if the length of time ahead of schedule by which work is shifted forward is known.

Projecting the Efficiency of Direct Labour with a Given Standard at any Stage of Production : The manufacture of a part consists of fabrication (L.C.R. 88%) and final assembly (75%) (See Fig. 9).

Total standard hours as calculated by the estimating department at the 500 hours point :-

Fabrication 20 hrs/unit.

Assembly 50 hrs/unit.

TABLE

		Jan.	Feb.	Mar.	Apr.	May	June	July
(A)	Schedule of Planes ...				20	40	60	80
(B)	Cumulative schedule ...				20	60	120	200
(C)	Projected hours/plane (from learning curve) ...				900	510	357	278
(D)	Projected Load (×1000 hrs.) (A) × (C) ...				18.0	20.4	21.4	22.2
(E)	Working days in the month ...	26	24	27	26	26	26	27
(F)	Labour hours/day (D/E) ...				690	730	820	830
(G)	Fabrication (25%) ...				170	180	200	200
(H)	Sub-Assembly (35%) ...				240	250	290	290
(K)	Major Assembly (40%) ...				380	300	330	340
(L)	Fabrication 2 months early ...		170	180	200	200		
(M)	Sub-assembly 1 month early ...			240	250	290	290	
(N)	Major Assembly on schedule ...				380	300	330	340
(O)	Total hours/day (L) + (M) + (N) ...		170	420	830	790	620	340
(P)	Labour load in the month (× 1000 hrs.) (0) × (E) ...		4.1	11.3	21.6	20.6	16.2	9.2
(Q)	Number of employees (direct labour) $\frac{(0)}{8}$ ...		21.2	54.0	103.8	98.8	77.5	42.5

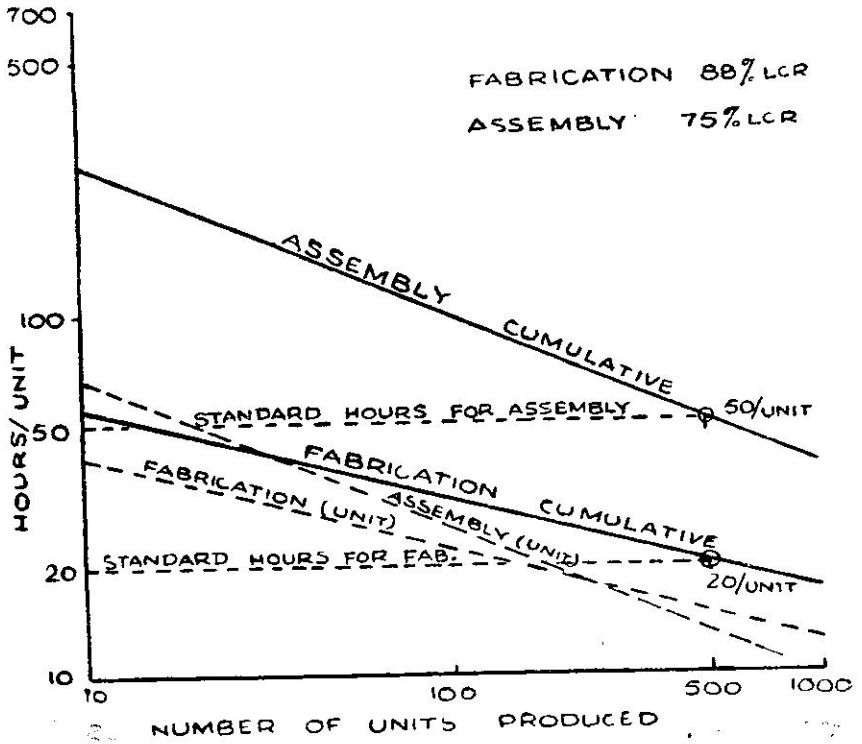


FIG 9 METHOD OF PROJECTING EFF.

Also, from records for a particular month, let

F = Detailed fabrication figures for a particular month.

S = Detailed assembly figures for a particular month.

Total standard hours for each month,

$$A = 20 \times F + 50 \times S \quad \ldots \quad \ldots \quad (14)$$

Total projected hours, each month,

B = F × expected labour hours for the month under consideration from the learning curve for fabrication.

+S × expected labour hours for the month under consideration from the learning curve for assembly ... ... (15)

∴ Projected efficiency for the month

$$= \frac{A}{B} \times 100$$

Make or Buy Decisions : The company 'Indiaco' received an order to make 1500 landing flaps from the Government. They made 200 landing flaps when they decided to sub-contract 'Bharatco' for manufacturing the same instead of making in their own shop. The decision was taken because of the other plant's higher efficiency in the particular line. In the meantime, 'Indiaco' received a cut back of order to only 640 flaps of the type. In order to decide about make or buy,

the following procedure (see Fig. 10) was followed :

Time taken by 'I'
to manufacture 200th flap=440 hrs.

Time taken by 'B'
to manufacture 200th flap=400 hrs.

Average labour/unit for additional 440 units if made in their own shop=355 hrs.

∴ Total labour input for additional 440 units if made in their own shop, 'I'
$=355 \times 440$
=156,000 hrs.

'B' have just started on their learning curve on receipt of the order.

Cumulative average
labour unit for 440units by 'B'=500 hrs.

∴ Total labour unit for
440 units by 'B'$=500 \times 440$
=220,000 hrs.

'Indiaco', therefore, decided to manufacture flaps in their own shop.

Financial Planning : A supplier 'S' takes a contract to manufacture 300 units from the purchasing agent 'P'. The supplier finds himself in a 'hole' while producing first 90 units. Fig. 11 explains the situation. Here the total cost and the direct cost are assumed to be synonymous.

In case the supplier cannot sustain the drain during the production of the first 90 units, the total contract may be conveniently broken into two or more with successively lower prices, as shown in Fig. 12, or by a single contract containing progress payments.

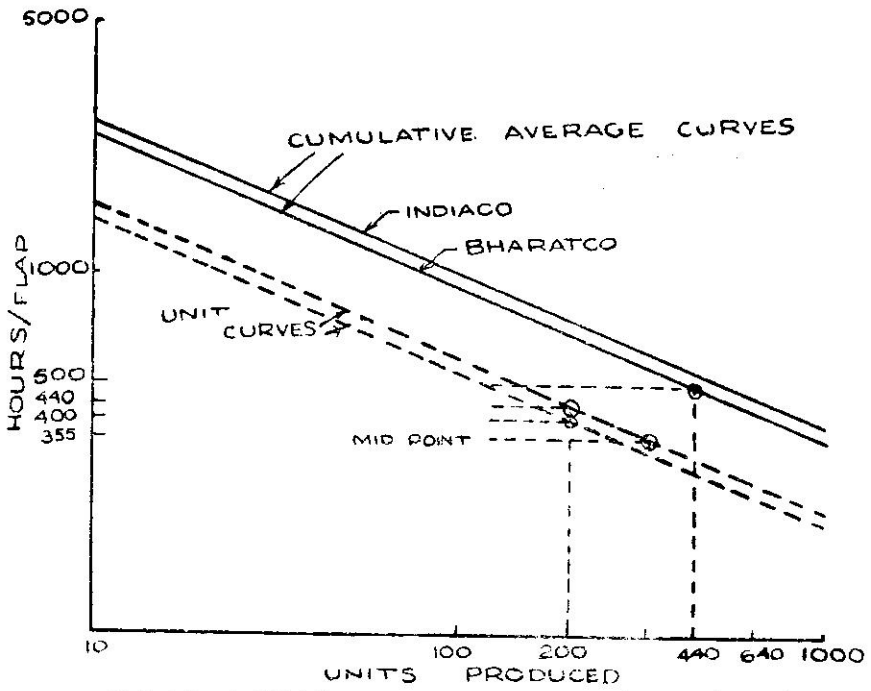


FIG 10: LEARNING CURVE FOR 'MAKE' OR 'BUY'

Determining the Effectiveness of Management on the basis of Statement of Gross Profit, or Estimated Loss in Case of Cut Back of Order : Automobile company 'XYZ' receives an order for 2200 'tempo' trucks to be supplied within one year.

From records, the following was observed :

(1) Maximum production rate/month ... 250

(2) Slope of the learning curve ... 85%

(3) Direct labour hours (cumulative)/unit for 2200 units from learning curve ... 100 hrs.

(4) Break up of estimate :

(a) Raw material Rs. 2000/- (assumed constant)

(b) Direct labour for 100 hrs., @ Re. 0.50/hr=Rs. 50/-

(c) Overhead for 100 hrs., @ Re. 1/hr=Rs. 100/-

(5) Cost estimate/unit = Rs. 2,150/-

(6) Selling price = Rs. 2,200/-

In order to estimate the monthly cost of sales, (see Table II) the unit cost is calculated as follows:

Let U = Unit hours for monthly cost of sales (Column 9)

H = Cumulative hours per unit, from learning curve for the total period of production (column 6)

= 100

TABLE II

UNIT HOURS FOR COST ESTIMATING

Month	Units Produced		Actual hours/unit		Cumulative hours/unit (Learning Curve)	Correction of hours required		Unit hours for estimating monthly cost of Sales
	Monthly	Cumulative	Monthly	Cumulative		Unit	Cumulative	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	20	20	360	360	320	40	800	140
2	80	100	260	280	218	62	6,200	167
3	150	250	147	200	170	30	7,500	109
4	200	450	143	175	147	28	12,600	126
5	250	700	105	150	132	28	19,600	128
6	250	950	93	135	122	13	11,450	76
7	250	1200	87	125	115	10	12,000	103
8	250	1450	96	120	110	10	14,500	110
9	250	1700	72	113	106	7	11,900	90
10	250	1950	89	110	103	7	13,650	107
11	250	2200	89	108	100	8	17,600	114

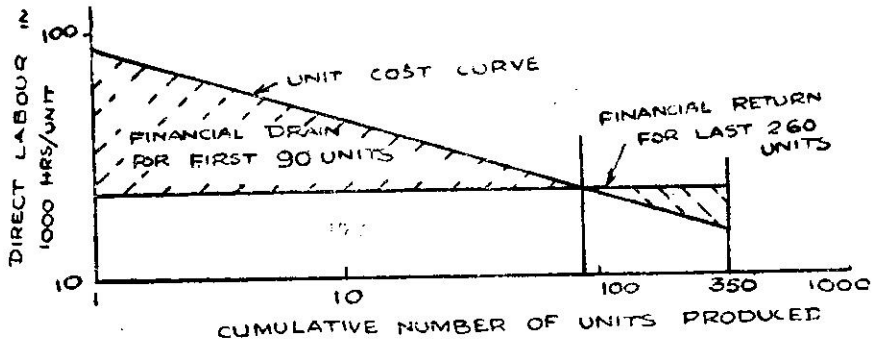


FIG. 11 LEARNING CURVE FOR FINANCIAL PLANNING

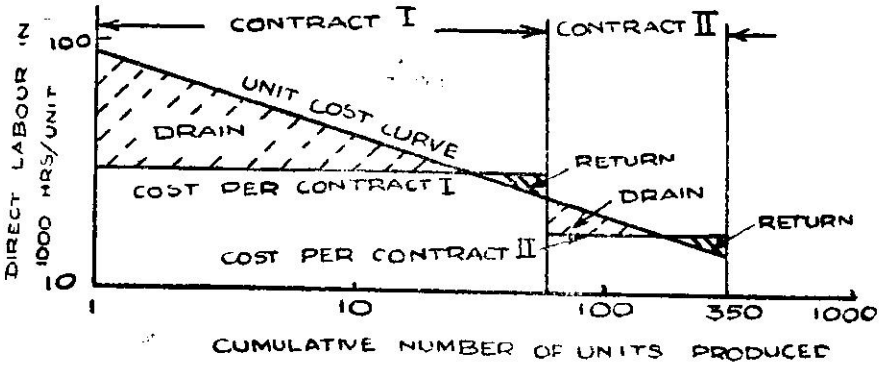


FIG. 12 STEPPED CONTRACT FOR FINANCIAL PLANNING

C_c = Cumulative correction, current month (column 8)

C_p = Cumulative correction, prior month (column 8)

N = Number of units shipped during the current month (column 2).

Then, $$U = H + \frac{C_c - C_p}{N} \quad \ldots (16)$$

The gross profit results, calculated by the two methods: (1) Actual cost method (2) learning curve method, are shown in Table III. A comparison of columns (5) and (7) shows the learning curve, indicating a true picture of the gross profit. For example, if the fiscal year closed after the third month, the actual cost method would show a loss of Rs. 25,000/- (45.5%) in excess of the selling price whereas by the other

TABLE III
GROSS PROFIT—LEARNING CURVE *VERSUS* ACTUAL COST METHODS

Month	Total Sales		GROSS PROFIT				
			Learning Curve Method		Actual Cost Method		Cumulative Difference
	Monthly Rs.	To Date Rs.	Monthly Rs.	To Date Rs.	Monthly Rs.	To Date Rs.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	44,000	44,000	(200)*	(200)	(6,800)*	(6,800)	6,600
2	176,000	220,000	(1,120)	(1,320)	(15,200)	(22,000)	20,680
3	330,000	550,000	5,500	4,180	(3,000)	(25,000)	29,180
4	440,000	990,000	2,200	6,380	(3,000)	(28,000)	34,380
5	550,000	1,540,000	2,000	8,380	10,600	(17,400)	25,780
6	550,000	2,090,000	21,420	29,800	11,000	(6,400)	36,280
7	550,000	2,640,000	11,500	41,300	18,500	12,100	29,200
8	550,000	3,190,000	8,800	50,100	14,100	26,200	23,900
9	550,000	3,740,000	16,100	66,200	24,100	50,300	15,900
10	550,000	4,290,000	10,000	76,200	16,600	66,900	9,300
11	550,000	4,840,000	7,300	83,500	16,600	83,500	—

* *Figures in Brackets indicate loss.*

method it would show a profit of Rs. 4,180/- (7.6%). The actual cost method thus gives an incorrect picture of the true progress of the manufacturing process. Others would find it relatively easy to show profits whether they actually work for it or not.

In case the contract is cancelled at the end of the sixth month the loss to date of Rs. 6,400/- would have remained on the book; but the settlement would otherwise have been made at 'no charge' basis, had the learning curve method been followed.

The above example indicates the importance of the learning curve, which cannot be overlooked where cut-backs are frequent.

Conclusion

The concept of 'learning' is relatively new in industry, and is yet to be refined to be accepted as a scientific tool. Every management has, however, realised its importance in financial planning and accepted the above as a fact of business life. It is more vital to India as most of the industries are yet passing through the preliminary stages of development, where the output is undoubtedly affected by the learning process.

VINAY P BHENDE *Purdue University, USA*

Multishift Operation in Indian Industry

There are two important factors limiting the rate of development, namely, capital and foreign exchange. It is argued by many planners that overpopulation is also a very serious limiting factor. However, increased population brings in not only increased consumption but also a vast potential for work. In many developed countries increasing population has been a source of economic progress. In a healthy economy, additions to the labour force mean additions to the national resources. The fact that the plans of a country cannot take cognizance of her rate of increase of population, reflects the failure of the planners to devise proper plans which are best suited for the country's growth. The new strategies and programmes must therefore lay heavy emphasis on the maximum use of all available resources, particularly, the country's own human, material and financial resources. This is just the *summum bonum* of preparing all development plans.

THERE IS A VAST DIFFERENCE BETWEEN THE economic structures of the developed western countries and India. The technological development of the western countries, especially mechanisation and automation, is the direct result of the scarcity of skilled as well as unskilled labour supply, among other factors such as scientific and industrial research, enlightened management and the competitive structure of the economy. The situation in India is quite different, with marked oversupply of labour and shortage of capital to invest in high cost machinery. Therefore, instead of borrowing the technology from foreign countries, the problems must be analysed in the light of the conditions prevailing in India.

Multishift operation of the production facilities seems to be the most promising solution for the present problem.

In a typical Indian manufacturing enterprise, overhead costs occupy a large portion of the manufacturing costs. Since most of these overhead costs are nearly fixed, such as rent on land, depreciation of machinery, and interest on capital investment, total manufacturing costs do not increase proportionately with increase in production. Also, most of the manufactured goods have a large market, so that all goods can be

sold, and that too, without considerable reduction in the sales price. Hence, for all practical purposes, the revenue from sales will be directly proportional to the production. As shown in Figure 1, the net profit for the enterprise (Revenue from Sales - Total Cost of Production) increases with increasing production. If the sales have to be increased by

1. slight reduction of the price, the revenue curve will bend slightly downwards as shown dotted, or
2. increased advertising and sales effort,

the total cost curve will bend slightly upwards as shown dotted.

In any case, it is obvious that the profits increase with increase in production. This indicates the potential gains an enterprise can enjoy by increasing its production.

The increase in production can be brought about in two ways :

1. By buying new machinery, which calls for increase in capital investment: In this alternative, additional capital outlay is required. Fixed costs will then increase, reducing total profit. If operating time is kept the same, say an 8-hour shift per day, and the same technology is used, production can be doubled only by doubling the equipment.

2. By operating the same equipment more intensively, e.g. in two or three shifts: Production can be increased without buying any new equipment, by using the available equipment more intensively, e.g. by changing from one-shift to two-shift or three-shift operation. This draws upon the available labour, without demanding additional capital outlay, and, therefore, suits Indian economy. The only additional cost for changing from single-shift to multishift operation is the cost of labour, which does not constitute more than 3 to 4 per cent of

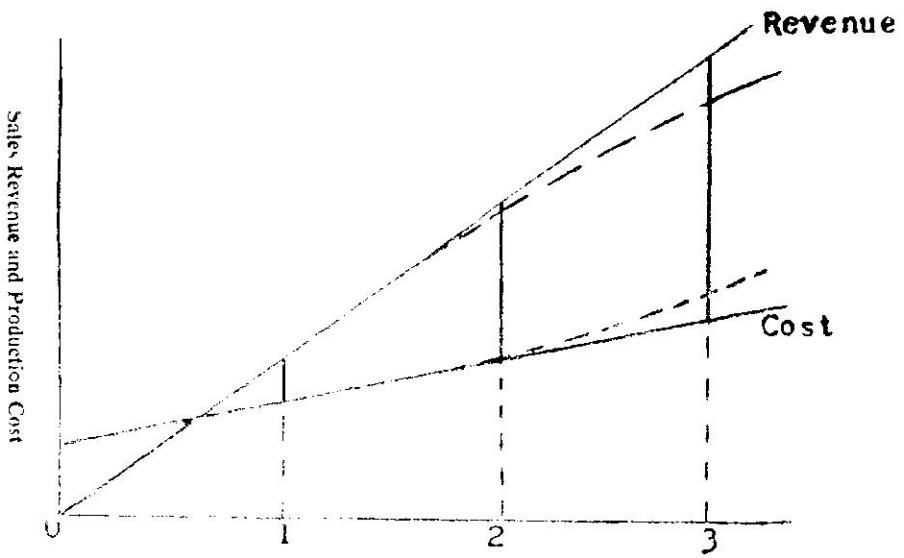


Figure 1. Relationship between Production Cost, Sales Revenue and Production Quantity

the total manufacturing costs in a typical Indian enterprise, e.g. job-shops, sheet metal industries, machine tool industries, etc.

To indicate how multishift operation suits Indian economy, as compared to western economies, an example of a typical machine tool factory in India and its counterpart in the USA is given in Table I. The main difference in the two lies in the proportion of Direct Labour Cost (2) and Equipment Cost (3).

TABLE I

	Monthly Wages of Operator (2)	Monthly Equipment Cost (3)	Ratio of $\frac{(3)}{(2)}$
India	Rs. 150	Rs. 2,000	13.33
USA	$ 300	$ 500	1.67

Typically, the ratio of $\frac{\text{Equipment Cost}}{\text{Operator Wages}}$ in India is about 8 times that in the USA. This difference in the ratio shifts the optimum man-machine combination in economies like India towards labour-intensive methods.

Effect on Production and Employment

Multishift operation is not only profitable for the enterprise, but can also have tremendous impact on the national economy as a whole. Its effect on production is shown in Figure 2. Its effect on employment is shown in Figure 3.

Thus, with three shifts, 6 days per week operation, production can be increased approximately 2.8[2] to 3 times. With 3 shifts, 6 days per week operation, employment will increase to approximately 3 times[3].

[2]This allows for cutting each shift of 8-1/2 hours (including lunch break) to 8 hours, due to 3-shift operation.

[3]Actually, the increase in employment will be slightly less than 3 because the administrative work force will increase less than proportionately.

Figure 2. Effect of Multishift Operation on Production.

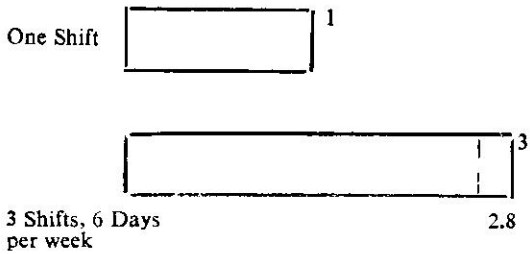
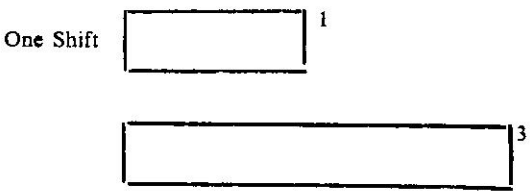


Figure 3. Effect of Multishift Operation on Employment.



If many industries will change over to multishift operations, they will make extra profits[4] and at the same time, the problem of unemployment will be eased.

Probable Obstacles for Multishift Operation

It is now clear that many industries have scope for increasing profits substantially, by multishift operation. This holds true for many industries, which have additional demand for their finished products, raw materials for which are available, the main limitation being posed by the capacity of the equipment. Many such industries are still running in one shift, *the chief barrier being inertial.* Several reasons for this inertia to change are :

[4]This requires detailed examination: (a) marketability at nearly current prices of three times the output (b) corresponding availability of raw materials (c) development of skilled labour—*Editor*

1. Added responsibility and work for the engineers and managers, especially due to the scheduling of shift work assignments to the workers.
2. Nearly all people prefer work in day shift to working in night shifts.

Certainly, this solution demands careful planning from the executives. Many people will have to work at night, for about four months in one year. However, this is not a very difficult problem, since night-shift work can be compensated by slight increase in remuneration. In any case, *people will always prefer to work at night than to remain unemployed.*

In general, executives dislike the idea of multishift operation, mainly because *it makes their jobs more demanding.* But the gains to the enterprise and the *gains to the society due to elimination of unemployment* are definitely worth the effort.

Role of Government

Government can formulate effective schemes in creating a favourable atmosphere for multishift operation of the manufacturing plants. More private enterprises may engage in multishift operations if Government will give proper encouragement and incentives to the enterprises for the same. These incentives can be given in numerous ways, a few of which are cited here.

(a) Proper modification in the tax structure will be a good stimulant. *Tax reductions should be offered to enterprises operating in multishifts. Tax reductions should be offered to the companies on the basis of employing more people*[5]. This will induce the entrepreneurs to resort to labour intensive methods, and there will be increased tendency towards multishift operations.

(b) Licensing authorities should use the criteria of production per unit of capital investment or unit of foreign exchange. In the absence of any definite criteria, other considerations such as political favourtism, or corruption are likely to exercise influence.

(c) Special price reductions should be given for consumption of electrical power during night hours.

(d) In some places multishift operations pose transportation problems. The transport authorities should take measures such as street lighting, building better roads, etc. This aspect is very much neglected.

It is the prime responsibility of the public sector and the state operated industrial estates[6] to utilise the equipment to the fullest extent by resort to multishift operation. This will set an example for the private enterprises.

To summarise, Government must make every effort to create an environment where private enterprises will be induced to enter into multishift operations.

Role of Labour Unions

The labour unions can also play an important part in bringing about this transition.

Typical demand and supply curves of the labour market in India are drawn in Figure 4. DD′ is the demand curve and SS′ is the supply curve. The equilibrium point lies below the subsistence level ABC. This necessitates the fixing of minimum wage level which is represented by OA. At this wage rate, AC is the supply of labour and AB is the demand for labour. The difference BC represents the present level of unemployment.

[5]The first suggestion is extremely sensible. The second is likely to lead to 'black' practices—*Editor*

[6]Industrial estates are largely rented out to private entrepreneurs—*Editor*

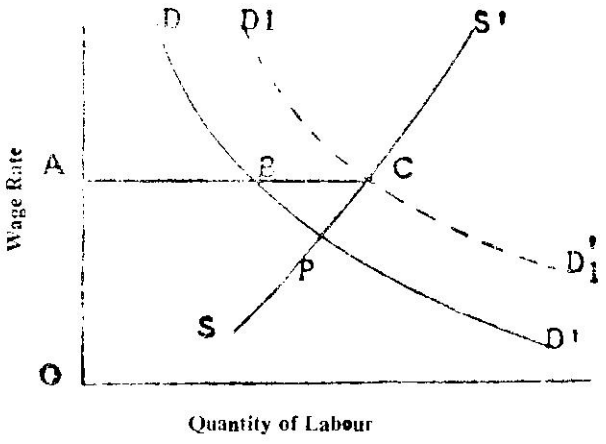


Figure 4. Relationship between demand and supply of labour and wage rate.

If somehow, demand for labour is increased, demand curve DD' will shift in the direction of $D_1D'_1$. $D_1D'_1$ cuts the supply curve C, which represents full employment level or nearly so.

Labour unions should take various measures to increase the demand for labour, such as

1. Increasing the productivity of labour by giving emphasis on proper training of workers.
2. Increasing the sales volume of finished products. Workers may help management in marketing and sales of additional products, thus sharing the responsibility with management. This is practised in some American industries (e.g. Union Carbide) in which unions also help to improve the relationship between workers and management.

In these and many other ways, labour unions can help to increase demand for labour. This will result in reducing the level of unemployment and, hence, in better utilisation of human resources.

Summary

To summarise, the present problems of the Indian economy consist mainly of shortage of capital outlay and foreign exchange, and excessive supply of labour. These problems can be successfully solved by proper utilisation of the equipment. Multishift operation of the industries is the unique answer to the above problems. Its uniqueness lies in the fact that it is advantageous to the business enterprises as well as to the society as a whole.

Unlike many other recommendations of the Planning Commission, it does not demand additional capital outlay and no additional risk is involved. Slight increase in running cost, which is necessary due to the use of additional labour, is much more than offset by the tremendous gains to the economy. It offers an employment index[7] as high as 3.5 and production index[8] as high as 3.3.

Multishift operation offers high profits to private enterprises and promises to improve the employment level. More employment increases purchasing power of the people, thereby increasing the demand for various goods which, in turn, calls for higher production and more employment, thus steadily improving the flow of money.

Realising the potential gains promised by multishift operation, Government, entrepreneurs, managers, engineers and the labour unions should share their responsibilities and play their vital roles in increasing the productivity of Indian industries, which will improve the overall standard of living.

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[7]Employment Index = $\frac{\text{Estimated maximum employment with multishift operation}}{\text{Full employment in single shift}}$

[8]Production Index = $\frac{\text{Production capacity with multishift operation}}{\text{Production capacity in single shift}}$

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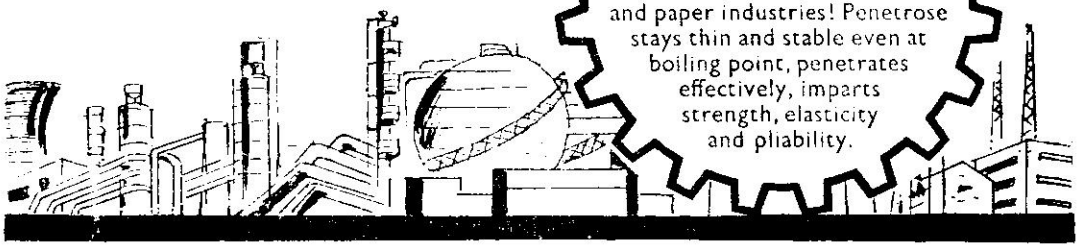

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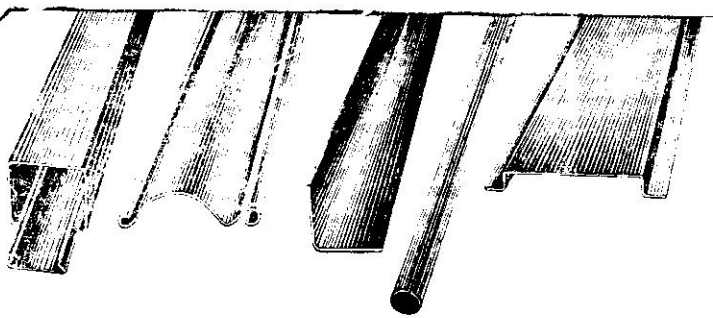

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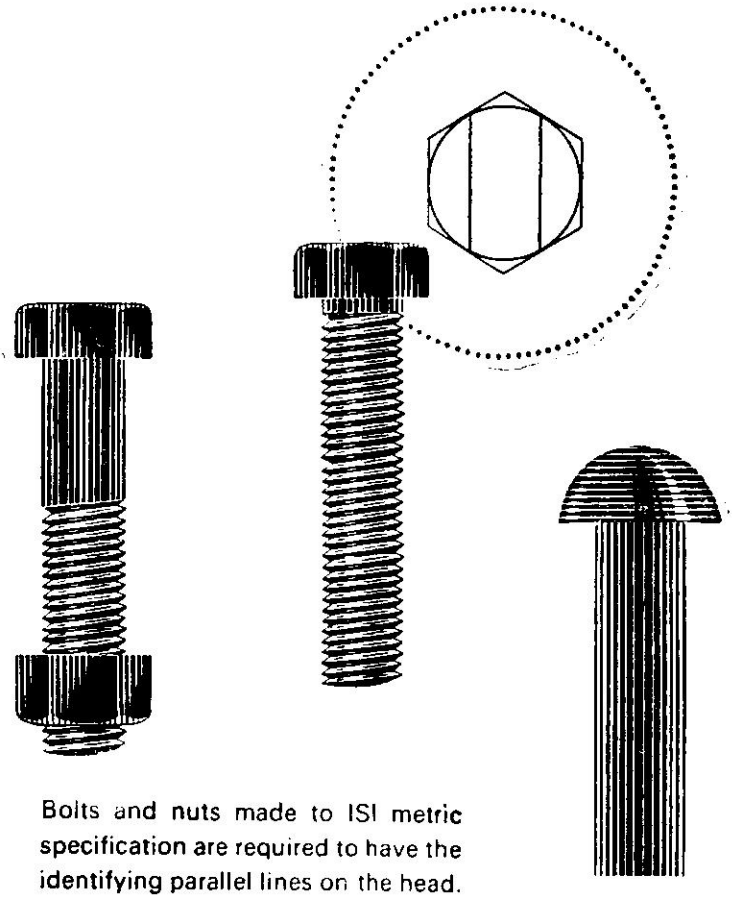

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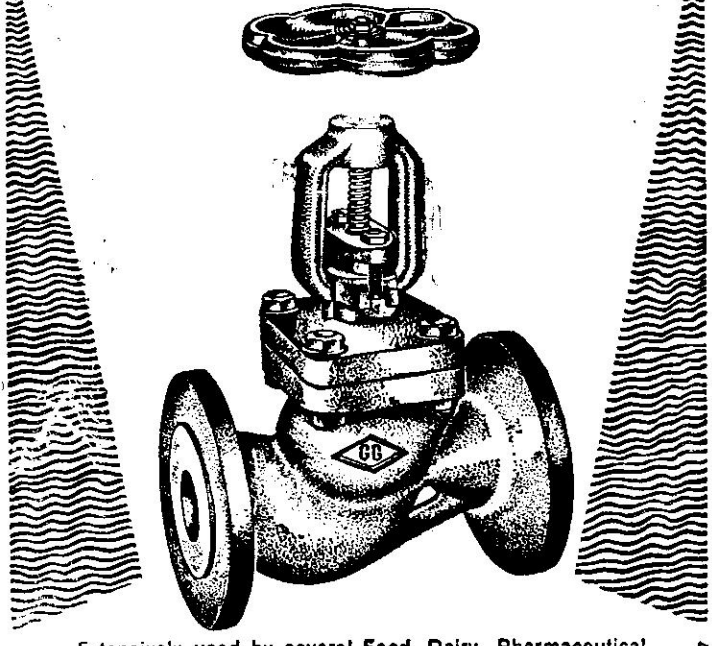

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Human Relations in Industry

PARTICULARLY IN THE MATTER OF HUMAN relations in industry, I am completely ignorant. Today, I know there is a tremendous volume of literature available on the subject of human relations in industry. I also know that a number of seminars and group discussions are held, papers are presented, at which this problem is discussed. Some three years ago, I was myself the Chairman of the National Productivity Council. I was aware of all that was going on. But I could never take part in any of those discussions or seminars because I was supposed to be well above them. I was supposed to be too senior to take part in those things. So I missed the advantage of all the modern education that one gets on this subject.

When I was a youngster and started service, there were no books on the subject and people would have exploded at the idea of having a seminar on human relations. When I started as a young Assistant Collector in the Civil Service, my first Collector told me, "Go out and do the job!" That was all I was taught about human relations. He himself, as I subsequently discovered, was not terribly good at it because he never rose above the rank of the Collector of a District.

We had a very distinguished professional—from a country which I shall not mention—who arrived in India two years ago to teach our people human relations. He was living in a flat in Delhi on the ground floor and there was a countryman of his living in a flat upstairs. This expert on human relations quarrelled so persistently with the family living upstairs and so one day the quarrels reached such a pitch of fury that the Embassy concerned intervened and shoved him out of the country at forty-eight hours notice. On occasions, I have felt that perhaps experts are not so expert as all that and there may be need for injecting the so-called wisdom of an amateur into this particular problem.

It has been said that we are meeting in a time of very grave difficulty. I know this is the sort of thing that is always said. Every year we say this—I can produce statements from Ministers in Delhi and the States each year since 1947 saying, "This is the year of crisis!" But looking back over the years since 1947, I can tell you quite frankly that in my judgment, the last twelve months

*Sri HVR Iengar was invited to inaugurate the 8th SITRA Conference on Human Relations. Extensive extracts from Sri Iengar's speeeh are given here, as it is really something too interesting to be missed; also there are references to NPC, of which he was formerly the Chairman.

have been, in fact, a year of crisis with which we could only compare one previous year and that was 1947 itself. I was in Delhi in 1947. I started in that year as the Principal Secretary to Mr. Nehru. So I was in the very heart of things and I can tell you that in the first few months after Independence it was really 'touch and go' as to whether we could survive as a nation, because of the tremendous holocaust which was spreading in the Punjab. It started in Lahore and Amritsar, spread eastwards and the fire caught on in Western U.P. If the leaders of the time were not really great people—and if, may I add, the civil services including the police had not done a magnificent job of work—I am pretty certain, having known things from the inside, that the flames would have enveloped the whole of the Gangetic plain right up to Bengal and if that had happened, heaven knows where else they would have spread. The very survival of this country would have been in very serious jeopardy. After that, although we have had series of problems each year, I should imagine that the last twelve months have been really serious.

We have all heard about the drought. I have seen the statistics about droughts. I have also heard about the drop in food production and the like. One does not really get an impression about these things unless you go and see for yourself the human impact of these droughts.

The other day, I was driving from Bangalore to Mysore. Some of you may know that there is a large sugar factory on the road about thirty miles from Mysore. It is a lush, green area and normally they crush about four hundred thousand tons of sugarcane. The factory is completely closed now and will be closed for the next twelve months. There is not one ton of sugarcane grown in that area and that is because there was not a drop of water that was led through the canals and that is because there was no rain in the catchment area of the rivers.

That is a dramatic illustration and one of the dozens that can be mentioned of the sort of problems that have come to us as a result of the drought. It has, in fact, been one of the worst that we have had since the turn of the century.

On the top of that, we had the Indo-Pakistan War. One effect of that war has been that a good deal of aid that we were expecting, that we had planned for and that we have taken into account in all our calculations, was stopped. In principle, it was the American aid that was stopped. It has come back in driblets. But the bulk of it is yet to come. It has had a tremendous effect on the whole of our economy. It illustrates the extent of our dependence today on foreign assistance for the ordinary running of our economy.

Red Tape in Administration

There are various other things that have happened. As one who has spent most of his years in administration, one of the recent developments that I regard with particular gravity is the impact on administration of certain recent events that have taken place in Delhi. You have all heard of red tape in Government. *If I am expert in any one subject, I suppose I should say that I am an expert in red tape.* We have heard a great deal about it—the delays that take place, the lack of co-ordination and all the rest of it. *What is happening in Delhi today might easily lead to a complete paralysis of administration.* I am mentioning this because I want to highlight the background against which the particular problem of human relations in industry today has to be discussed.

A friend of mine was setting up a factory where some explosive stuff was being manufactured. He wanted a telephone for the factory. He asked the local Sub-Divisional Officer and he said, "I can't jump you up in the queue. I will have to put you down in accordance with the date of your application and in accordance with that, it will be about two years before you get a

telephone. I suggest, you go to the Post Master General; he has the authority to put you up in the queue and to sanction a telephone; he has the discretion." So my friend went and saw the Post Master General of the Circle concerned. The Post Master General said: "You are a good friend of mine and ordinarily I would love to do this for you. Indeed I have the discretion to allow telephones out of turn to people. But in view of what has been happening in Delhi recently, I do not propose to use my discretion. I would not give you a telephone although you are a very good friend of mine and although I know that if there is any factory that needs a telephone it is your factory because you are dealing with some explosive material. However, *I would not give you a telephone unless you get me a letter from the Cabinet Minister!*"

I have been in Delhi in the last few days and I met a number of Secretaries and Ministers. I met a Cabinet Minister who told me that he was quite prepared to approve of a particular proposal that I had put before him. But he did not propose to take the risk of deciding it finally himself—he would pass on the papers to the Prime Minister. Now, this usually is much more serious than it sounds because it means what you really require in administration—if you have got to get moving in these days—namely, a capacity to decide things, a capacity to take risks, a capacity not to duck responsibility, and not to shove the responsibility on to other people, that instead of getting any better, is actually getting worse.

What is happening is that in addition to a drought, the like of which we have not seen in the last sixty-five years, in addition to Devaluation it has set up a series of problems which were not expected by the Government or other people. In addition to the shortage of foreign exchange, and a whole series of other problems, including the elections, which also creates certain problems, we have the *problems of deadening hard of fear in the hands of administration.* All this mounts up to a very considerable total. This is the background in which we have to consider every single problem today, whether it is a problem of technology, management, finance or even human relations in industry.

The 'Wage Freeze'

The matter is further complicated by the fact that people talk somewhat loosely about things like a 'freeze on wages', 'a freeze on incomes' and so forth. We have the dreadful habit in our country of just copying certain phrases which are used in other countries without the slightest regard to the fact that conditions in other countries and the circumstances which arise in other countries are not applicable to India. There is a meaning in a 'wage freeze' in UK in today's conditions and they are trying desperately hard to avoid the devaluation of sterling. There is a meaning in the 'income freeze' in the UK, but it has no meaning in a country where prices are rising.

I was looking the other day at the weekly statistics published by the Reserve Bank of India. The latest wholesale price index figure is 190 when compared with 1952-53. Less than four years ago, it was only 125. In other words, in less than four years, the wholesale price index has gone up by a little more than fifty percent. I am afraid, this is an under-estimation of the actual increase that has taken place, insofar as the ordinary man is concerned—the man whose wants are confined to food, some little clothing and shelter. So far as he is concerned, the chances are that the cost of living has gone up much more substantially than is indicated by the movement of the wholesale price index. Therefore, *in a situation like this, to talk of a wage freeze, or an 'income freeze', seems to me rather meaningless.*

This situation which I have described to you in a rather bold rush has come upon us at a time when, in my judgment, there was already a somewhat unhappy relationship

between management and labour. Looking back over the last few years, allowing for the fact that there have been times when for emotional reasons such as immediately after the Indo-Pakistan war, there was a euphoria —there was an upsurge of patriotic feeling— which gave rise to very desirable results in various fields. Allowing for rather spasmodic events like that, the relationship has been rather an uneasy one. It has been a little worse than uneasy. I am not well-versed in the field of industrial relations in the factory area. But I have a fair amount of knowledge of what has been taking place in the Banking Industry.

The Banking Industry

I would like to take that as an example to indicate the way my mind is working on this particular problem. When I was in the Reserve Bank, I discovered that the relationship between the Bank and the employees was an extremely unhappy one. It was marred by the fact that there was a great deal of suspicion and a great deal of hostility. The unions were writing the most terrible letters to the Governor making all kinds of allegations. They were intemperately worded and the charter of demands that they gave was so impossible that there was no possible meeting ground and ultimately the matter was referred to adjudication. Even after adjudication, the relations were no better. The relationship in the commercial banks was also no better.

I was wondering why this was happening. There is no use getting angry, agitated and bitter about this. Here was a human problem; here were people who were educated; who had a job, wife and children; who wanted steady employment and yet who were behaving in, what I thought was, a completely irrational manner. Reflecting on this situation, it occurred to me that *this is perhaps just a swing of the pendulum* which previously had gone to one extreme and which is now going to the other extreme.

I made some investigation as to what was happening in the olden days, in the pre-war days, in the Banking Industry. I looked, for instance, at the conditions of employment of a clerk in the Reserve Bank say, before September 1939 and the conditions of employment of the Governor and the Deputy Governors and the very senior people. In those days the Governor of the Reserve Bank was getting a salary of Rs. 10,000 per month and he needed certain amenities. The income and the super tax in those days was not particularly high. In fact, it makes one's mouth water these days to read about the tax rates before September 1939. A graduate clerk in those days was started in the Reserve Bank on Rs. 30 or Rs. 40. The result was that you had a situation in which the top man in the institution was getting emoluments which were two hundred and fifty times the emoluments of a graduate who started at the bottom of the ladder. It was conceivable that the man who started as a clerk was perhaps very intelligent, well-read and was extremely ambitious and wanted to get along.

There were other things that happened in those days in the Banking Industry. There was, for instance, in commercial banks, no such thing as overtime. The chap just logged along from morning till night till he finished his work I once met a union leader and asked him why he was so bitter. He once led a procession right up to my house, shouting all sorts of things about me: "down with so-and-so" and all the rest of that. I caught hold of him one day and asked him why he was so bitter. He told me that he was himself a clerk in the old Imperial Bank of India. On New Year's Eve—the 31st December—he and his colleagues had to balance their books. He said that *they sat up till 3 o'clock in the morning on the 1st of January and the management in those days did not think it proper to give them a meal, or any overtime allowance—and 3 a.m. in Lahore can be bitterly cold.* He said, "I had to walk home at 3 a. m. on an empty stomach; that is why I am bitter". I argued with him that it was quite unreasonable to nurse this sort of grievance on the memory of a

past hatred. I said, "1939 is gone; we are now in the year 1962 when conditions are infinitely different."

I know from personal experience what the Governor of Reserve Bank gets now as 'take home pay' as a result of the taxation that we have now. I know also what a graduate clerk starts on in the Reserve Bank today. The proprtion is no higher than ten to one. It used to be two hundred and fifty to one which is so much greater than ten to one. I can assure you from direct knowledge that this proportion is no higher than what it is in the Soviet Union today. There are a number of organisations in the Soviet Union where the man at the top gets about ten times the emoluments of the workmen right down at the bottom.*

The Social Revolution

The social revolution that has taken place in India over these last few years, as a result of the taxation and the wage policy of the Government, as a result of the interest that they have taken in the welfare of labour and so on, has resulted in this situation. The tremendous disparity that used to exist in the olden days is no longer true. The disparity now is so modest that it is no greater than what is taking place today in the most socialistic of countries, whether it is Sweden or the Soviet Union.

I tried to analyse the reason for this and to find out why, in spite of the fact that conditions of living have progressed so substantially, that there is still this bitterness. Quite frankly, I have not been completely able to understand except that perhaps the swing of the pendulum had to take place and historically it always takes a little time for the pendulum to swing back a bit.

We can take the field of employment in other industries too. I was talking to a friend of mine the other day who is an expert in plantation labour. He was telling me a story which was very similar. He said, the conditions of living among the plantation labour about twenty-five years ago were shockingly bad. As a result of numerous steps taken by the Government, by the employers and agitation by the workmen, conditions have vastly improved. Nevertheless there is a simmering of hostility and suspicion in the minds of the employees in the plantation industry. If you look around the whole field of industry, including banking, and Government services, you will discover that although there may be, in places and on occasions, certain sort of comradeship, on the whole there is a certain simmering of bitterness, suspicion, hostility and frustration. That is the generality of the industrial situation as we see today.

What has led to this and what can be done about this ? It is no use going back to history. In Madras, in 1919 or 1920 I think, Mr. Wadia who was then in the Theosophical Society was encouraged by Annie Besant to start a trade union for the purpose of organising workers to put forward their demands before the employers in Madras. Mr. Wadia was actually prosecuted on the ground that he had indulged in criminal conspiracy against management. The first Trade Union Act that we have had

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*Srimathi Parvathi Krishnan (Vice-President, AITUC, Coimbatore) who welcomed the delegates after Sri Iengar had inaugurated it, remarked with reference to this point: "I do not disagree with Sri Iengar when he said that the disparity in income in the Soviet Union may, in some cases, be much greater than the ideal. But, one must also remember that the perquisites in the Soviet Union are pretty well compensated. The Soviet worker has got the same amenities as any other Soviet citizen regarding health, education, holiday, etc. So, there is no point in comparing the position with Britain, the United States of America or the Soviet Union."

In this connection, it is worthwhile quoting from Prof. R Natarajan's talk at the Applied Industrial Relations Seminar, organised by the Industrial Team Service, St. Marks Cathedral, Bangalore: "In USA, the difference of salary between a manager and a worker is of the order 6 : 1; in Russia it is 4 : 1. A Russian manager with a wife and three children has to pay 13% of his salary in taxes. An American manager similarly placed has to pay 17-19% of his salary in taxes. (**Aspects of Top Management**, edited by the Rev. AH Batchelor, pp 2-3, 1967)

in our country was in 1926. This is old history. It has occurred to me that after all we are adult enough not to harp back to past history. It is better to take into account the situation as it is today.

If I may expound the situation today, it is more unhappy than I have described. *What is happening today, I am afraid, is not a premium on productivity but a discount on productivity;* not a premium on discipline but a discount on discipline. It is virtually impossible to sack anyone on the ground that he is hopelessly incompetent at his job or that he is indisciplined.

I know of a factory which has been set up at a cost of several crores of rupees, where production has, from time to time, been seriously interrupted—a great loss to the company and a very grave loss to the country because the factory is producing stock of very vital importance to the country. It is in fact a fertiliser factory. An analysis has been made of all the breakdowns that have taken place in that factory. The analysis showed that in every single case, the break-down was not due to operational faults but due to the faults of maintenance on the part of the engineering crew. Then the question was what was wrong with the maintenance crew? It was discovered that the maintenance crew had been recruited in a somewhat slipshod manner. When the factory was originally started, some man presented himself and said he had worked for twenty years in a Railway Workshop. "All right, you come along." Somebody else said that he had worked for fifteen years in some other workshop, and "All right, you come along!" So a rather haphazard system of selection was made. Anyhow, these people are there.

You can't get rid of them, because *it is virtually impossible to get rid of anybody on the ground of incompetence. What is even worse, you cannot improve them* because all the attempts that have been made to give some kind of an incentive for improving themselves, for improving their productivity including a certain incentive of wage for better performance, have collapsed because of the suspicion of these people that there must be some 'catch' in this business. So, they all get together, they feel hurt that they should be described as incompetent and they feel suspicious that something should be attempted by the management in order to improve their working. So the state of affairs today is exactly the same as it was two and a half or three years ago. All this is inimical at a time when it is absolutely of vital importance that our production improves and our productivity also improves.

Effects of Devaluation

Devaluation has been mentioned. It is perfectly obvious to us today, although it was not obvious to us on the sixth of January, that several things have gone wrong. Devaluation would have made sense if it was accompanied immediately by the injection of a massive degree of foreign aid, particularly of a non-project type, so that the productive apparatus of our country could be got going towards maximum capacity as quickly as possible. Studies have been made by the National Council of Applied Economic Research in a variety of industries and their analysis shows that anything between thirty to seventy per cent of our existing industrial capacity is at the movement lying unutilised either because of shortage of power, or because of shortage of raw material and the like.

If devaluation had been immediately accompanied by a great deal of non-project assistance, that undoubtedly would have meant something. The fact of the matter is that such good results as the economists would have expected out of devaluation have not happened because of this large delay in our getting this non-project assistance. Even today, we have little knowledge of the extent of non-project assistance we are going to get from abroad in the way of free foreign exchange.

In this situation, what is absolutely right is that we should increase our production. *We should get the whole of our productive apparatus moving as rapidly as possible—where there are factories working one shift, it ought to work two; where it is working two shifts it ought to work three; and when a factory is working three shifts, it has to increase its productivity.* Otherwise, I foresee real danger that the price level which is already high, and which is moving upward will rise still higher. One does suppose that as an effect of devaluation, there would be some increase in prices. I think that is unavoidable. It is unavoidable for the reason that in the Indian context, a great deal of import is still necessary.

To take one particular industry which I have in mind, we have to import machinery which in Rupees cost very much more than it did before devaluation. We have to import raw material for manufacture and it costs more than it did previously. The loans which have been taken abroad in foreign currency have got to be repaid in Rupees and more Rupees are required for the same than before; taking fertiliser industry for example, the cost of production would go up by thirty per cent as a result of devaluation. Government have promised to subsidise this. There are other industries also, about which various figures have been worked out.

By and large, as a result of devaluation, and in the particular circumstances in which we find ourselves in India today, there is bound to be a certain increase in prices. One would have hoped that this increase would be a temporary phase; and that the production would be moving as rapidly as possible. God willing, with agricultural production being good this year, one does hope that this temporary increase in prices would have been halted and thereafter we would have reaped such benefits as are possible from devaluation. But, it looks as if the situation is still somewhat confused, diffused and by no means clear as to what is likely to happen. What it means so far as employers, employees and Government are concerned is that *there is absolutely no hope for us unless we get production moving to its maximum possible extent.*

Role of Management, Labour & Government

What does all this mean insofar as the relationship between management and labour is concerned? In labour, I include not merely workmen in factories but also educated people working in banks, Government offices, commercial establishments, and all the rest of that. It is impossible to go into this problem without taking into account the attitude of Government. They are the third party in this matter of management-labour relations and they are a crucial party, possibly the most important party.

I take the view that at the time when Government took a real interest in the problem of relationship in industry, they were entirely justified in doing what they did. In 1920, an attempt to establish a trade union was regarded as a criminal conspiracy, which, of course, was fantastic. Government were quite right to set up a statute about the recognition of trade unions and the manner in which labour problems have got to be handled. Since then they have taken steps from time to time to amend the law. We indeed have in the statute a sophisticated degree of legislation. The question is, whether in the situation as we find ourselves today, the time has not come when Government should re-assess their own position in regard to management and labour or whether they should persist in the attitude which they have taken in the last few years.

Admittedly, when they began intervention in this problem, labour was at a very serious disadvantage. Labour was not able to stand on its own legs. It was not able to organise itself as a body against management and fight out its problems. But *the effect of Government policy over the last few*

years has been not to improve the chances of our having a real good trade union movement in our country but to reduce such chances. After all, what is it that we want in a good trade union—whether in a factory or in a Bank or in other commercial establishment ? We want a trade union which has got self-respect, which has got some feeling that it is a body possessed of some strength of purpose, which can sit down across the table and discuss problems with management, and has the weapon of the strike only as a last resort. But it should be in a position in this modern world to discuss problems in an intelligent way; it should be able to understand the problems of the management.

What is it that we want on the side of management? What you want management to do is not to wait till a dispute arises, not to wait till a strike takes place, not to take up the line that, "after all there is adjudication !" I do not regard this as a proper approach on the part of management. The result of this is to lead to perpetuation of a feeling between management and labour that they are two hostile parties to a dispute and that there is a permanent umpire always refereeing this boxing match. I do not think that that leads to a proper trade union spirit.

Look at what happened in regard to the Seamen's strike in the UK! The Seamen's strike came on at a time when the UK was in a serious balance of payments crisis, when there was heavy pressure on the sterling. It was vitally important for the UK that their external trade should expand. That was a time when hundreds and hundreds of ships were tied up in the shores of the UK. All that Government did was to pass legislation for an emergency and they never made use of that legislation. It was intended merely to give them sufficient strength in order to deal with an emergency, if, for instance, food supplies ran short and things of that sort. The matter was settled in the normal industrial way. I do not say that having started a trade union movement on official lines only forty years ago, we are today in the same position as UK, or that we are in any position comparable, for instance, with the trade unions in the United States of America.

The point I am making is that the drift of policy, the direction in which changes should take place, should be one in which there is a greater tendency on the part, both of management and trade unions, to get together and sort out their problems by mutual understanding rather than having this perpetual umpire refereeing this boxing match. At this rate, I do not think we will even have a genuine trade union movement in our country within the industry. There is management in India just as there are trade unions. Some managements are very good, imaginative, and friendly and they go out of the way to see what problems are likely to arise and they handle them in a human sort of way. But the bulk of managements take the line that the problems have to come to them before they deal with it. If no problem comes to them, if there is no strike, no dispute, or if something is not referred to them by the local committee, then they don't think of labour; they do not think that there is any problem. *They are like some friends of mine in the secretariat as heads of departments who do not think that there is any problem unless it comes up to them in a file!* Similarly, there are large groups of people in management who do not think that there is any problem in labour unless it is thrown up to their face in the form of a strike or some other dispute.

What is it that we want on the part of the trade unions? On the part of trade unions, we do not want the attitude that they are always a hostile force on the other side of the fence, that the management is somebody at whom you throw completely irresponsible demands in the hope that somehow or other the matter would be referred to adjudication and you will get some kind of a *modus vivendi* thrown in at you by the adjudicator. That is not the attitude we want. What you want in a trade union is

an attitude which takes into account the whole field of the industry concerned, both the management as well as the labour, as well as the consumer and consider that they are a part—although a vital and a necessary —of a whole apparatus which has got to move as one entity if results have got to be produced.

In the US, trade unions have got their own work study teams; they have got their own industrial engineers; they have got their own financial experts who are experts in examining balance sheets. They have in fact got a whole battery of the same sort of experts as managements have. They can afford this. This has not happened overnight. This is not going to happen overnight in India. It will take some time. The question I am considering in my own mind is, what is it that we are aiming for, what is the sort of situation that we hope to have in our country in another five, ten or twenty years? It is not a situation in which we find management and labour engaged in the same sort of relationships as is taking place in some of the advanced industrial countries. Or, do we perpetually have this feeling that they are two different people on opposite sides of the fence fighting and Government intervening with constant amendments to the Trade Disputes Act? The present situation, whatever its historical justification may have been, should not continue very much longer and we should aim consciously at a situation in which the whole approach, both of management and labour, should alter in the direction I have indicated.

The Objective View

I have been thinking about this for quite some time. I have the great advantage of not being an expert on this subject. When I was in the National Productivity Council three years ago, it occurred to me that some concrete steps should be taken in order to highlight this problem and throw at management, labour and Government a completely independent, objective view of the situation as it is in India today and how the situation should be improved for the better.

I am aware that we have got a number of experts in our country—leaders in the management field who are imaginative, farsighted and who take a very human view of their relations with the employees. I know there are some trade union leaders also who are equally good. I know that they take a broad view of the position of trade unions in this country and take a very imaginative view of the way in which things should be developed in our country. But unfortunately, what has happened is that you can always predict the views either of management or labour or even of Government in our country. You remember what happened at the Labour Conference the other day in Delhi? There was a certain view put forward by management and any one could have predicted that; there was a view given by different trade unions and you could have forecast it. There was a view put forward by Government with great force and unfortunately you could have predicted that too.

In other words, *the situation has got completely fossilized; it has got fossilized to an extent which I think is most unfortunate.* Everybody has got a set view on the subject. Management is conscious of its virtues and of the failings of Government. Trade unions are supremely conscious of their virtues and of the failings of management, and Government are always aware of their own virtues and also, of course, of the failure of management and, I suppose, occasionally of trade unions.

You have got to get out of this situation in which views have become completely fossilized. Therefore, although we have in our own country experts both in management, organisation of labour and the rest of it, it occurred to me, when I was in the National Productivity Council, that one way of breaking out of this ice might be to get a team from outside India—from a country which is not so highly sophisticated, a country which has been much later in the

matter of industrial development and trade union activities—for example Japan. This team, together with associates from India, should look in a completely objective, dispassionate way at this problem of human relations in industry in India and tell us what they think as outsiders.

One of the companies with which I am concerned put forward this proposal to the National Productivity Council and said it would finance for getting out a team like this and the preparation of a report. That was three years ago. I knew that *the National Productivity Council is an organisation where, fortunately, labour, management and Government sit together and work extremely harmoniously.* During the period of one year when I was its Chairman, there was not one single occasion on which hard words were spoken by anybody whether it was the labour leaders or the management people or the Government representatives. Somehow or other, nothing has come up of this suggestion. Things seem to take rather a long time in our country to decide. I am not sold on this idea; maybe this idea is not a particularly good idea; it may be that there are various snags which I have not foreseen. If this idea is not good, some other idea should be brought out.

What I think is essential today is that we should break out of the prison in which we have enclosed ourselves—the trade unions have enclosed themselves in a prison and I deeply regret to say that I do not see any change in the thinking in Government's mind; they have also enclosed themselves in a prison. We have got to get out of it if we are to make any real progress. How this is to be made, is a problem that has to be discussed. I do hope that some attempt will be made to re-assess the situation from a broad point of view and to get away from this feeling of frustration, suspicion and hostility and try to establish a set of relationships in which we have a really good, genuine, strong, healthy trade union movement and management with all its human responsibilities and Government which does not feel that wisdom lies in always being a policeman with a stick to beat both sides.

The Political Role of Labour*

BRUCE MILLENS 'POLITICAL ROLE OF Labour' was originally published by the Brookings Institution and this cheap edition has been brought out for our benefit and also for the enlightenment of our friends in the developing countries. It is a little difficult to say why the name of the Brookings Institution does not figure on the cover because that would have given it the status that the publication really deserves. The procedure by which such publications are brought out in Hawaii and printed in Japan for the benefit of the under-developed countries creates a somewhat awkward impression, as of some stuff being dumped on people who do not know and who ought to learn it from people who have gone along the right road with the Anglo-Saxons.

Actually the Book is absolutely first-rate and written by an intellectual who frankly and intelligently discusses the trade union problems in the developing countries including India; and who certainly knows what trade unionism is. Bruce Millen was a familiar figure in New Delhi as Labor Attache in the American Embassy; he was formerly Labour Adviser in the Bureau of Near Eastern and South Asian Affairs in the US Department of State. In fact, the project originated in the US Department of State and consultations were held with the Director of Foreign Policy studies of the Brookings Institution. As the President of the Brookings Institution explains it in the Foreword that Americans used to bread-and-butter type of unionism found it rather difficult to understand the political role of labour unions in the developing countries. They were, therefore, in need of a research base for making out "what policies should govern United States' attitudes towards it and to determine what practical measures would best assist the development of a stable trade unionism in the new states." So it is a frankly political study, done quite thoroughly; and in this Bruce Millen had the benefit of consultations with Kassalow, Director of Research of the AFL-CIO. Of course, the reading does create a strange impression, as India is lumped with Italy, France, Ceylon, and countries like Malaya, Liberia, Israel, Senegal, Cameroun, Algeria, Lebanon get in and out of certain categories. This creates a very strange impression in the Indian mind: how the Americans look on us as certain, peculiar species of humanity with whom they may or may not have truck, considering their material interests and their global strategy.

Except for this, the job has been well done by Millen and the reading is pleasant and instructive. The conclusion, of course, would be surprisingly shocking for people here, as also in the United States, namely, that it is in the interests of the United States to support socialist policies and socialist parties in the developing countries, socialism being the only effective antidote to communism. It appears to be Mr. Millen's determined conclusion that the support of non-socialist parties would lead to a political polarisation and the consequent strengthening of communism in the developing countries. It is very clear that Bruce Millen

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* *The Political Role of Labour in Developing Countries* by Bruce H. Millen, published by East-West Centre Press, Honolulu, Hawaii, printed in Japan by Tosho Printing Company Ltd., for distribution in Asia, Africa and Latin America, pages 148, price $ 1.50

has written no CIA stuff. He is an honest intellectual out to feed the American mind with what he thinks would be in their best interest to digest and to adopt, if research is to be the basis of State policy.

It is clear from a reading of the Book that the author has first-hand knowledge of trade unionism in practically every country of the world. He is, therefore, particularly qualified to recommend to fellow Americans that it would be suicidal for them to impose their particular brand in every country of the developing world.

Bruce Millen places all the cards on the table by quoting chapter and verse from Congressional Legislation. "It is an integral part of US policy to influence economic and political developments in the developing countries, using foreign aid as an instrument" (page 4, 5). It is part of US law quoted by Bruce Millen that the foreign aid programme is to be administered in a manner so as to eliminate the barriers to increased participation of private enterprise in resource development, to encourage, where suitable, competition and productivity, and the development and strengthening of the free labour union movement etc. etc. In a straightforward manner, Bruce Millen faces the problem and attacks it from the vantage point of personal knowledge, moderated by sobriety. It is clear that the goals of trade union leadership in the developing countries include "revamping the major rules governing the society." In the operation of most Asian and African unions, the political facet is durably and highly visible. In India—and here in Bruce Millen's categories, we are with France, Italy and Ceylon,—"dominance of ideological concepts...is the basis of highly politicized trade unionism carried on within the framework of a competitive political system. There is a history of left wing radicalism, including revolutionary socialism and communism, and the general or industry-wide strike for the attainment of economic and political purposes is still retained as a weapon. Union ties with political parties are the norm (page 12).... There is also a distinction in role for unions operating under the one-party systems common to Africa and those under multi-party systems as in India and Ceylon where the observer encounters the many puzzling problems of competitive unionism. And all of this must be traced within the context of a fluid political situation" (page 14).

Millen has interesting comments on "The Soviet trade union system in which I include the systems of all countries within the Sino-Soviet bloc...The unions have been the agents of the state since 1928, when Tomsky was replaced as head of the union federation by Kaganovitch as a consequence of the decision *to force the unions to be production-minded rather than consumption-minded*" (page 14, Italics ours).

Millen has something interesting to say about the amorphousness of the trade union organisation in the developing countries: "On first visiting a trade union in Asia and Africa a westerner is likely to ask himself: Where are the members? Where is the organisation? All that he can see is a tiny scantily equipped office, an officer or two, and possibly a clerk...the organisation appears to be all head and no body. Further study may reveal a series of executive organs at various levels, but these again seem to be representative of no one in particular...In a good many instances the men who stand at the top of the structure are self-appointed spokesmen...In none of the developing countries do the trade unions represent more than a small percentage either of the total population or of those who are working for wages. India is probably the most industrially advanced nation considered in these pages; its first national labour center was formed in 1920. Yet in 1958, Indian unions could claim as members only about 3 million workers out of a non-agricultural labour force of something under 40 million, or substantially less than 10 per cent. This is explained in part by the fact that only about 7 million people work under conditions which lend themselves to organisation" (page 18).

On India specifically, Bruce Millen has quite a good deal to say: "The move in India is toward the national industrial union, but, because of the country's size and the many linguistic and other divisions that exist, it may be that the state bodies will maintain their present dominance (page 22). The Textile Labour Association in Ahmedabad—once under the stewardship of Gandhi —is outstanding in many respects. It has a large modern headquarters, 200 paid employees, and collects over $200,000 annually in dues from its membership of approximately 100,000" (page 24).

Writing on Trade Union Leadership, Millen says: "In Asia, doctors, teachers, civil servants, and, most frequently, lawyers devote either part or full-time to the task of trade union leadership. Especially in India and Ceylon such professional people, frequently of high caste, have assumed direct leadership" (page 27).

On Indian Union Leaders irrespective of their politics, Bruce has interestingly stated the facts: "Mrs. Maniben Kara, president of the 40,000-member Western Railway Employees Union in India, is typical of the dedicated, social-welfare-oriented outside leader who has given years of service to the trade union movement. Mrs. Boze, a leader of the Calcutta dock workers union and, in 1962, elected president of the INTUC, was caught up in the movement as a consequence of her work as a physician in the port. S.A. Dange, Secretary-General of the Communist AITUC, is a Brahman from Bombay. The rosters of many other Indian unions include officers with similar distinguished backgrounds; so far, leaders tossed up from the ranks are in the minority—and most of them were formerly clerks, who constitute a certain kind of worker aristocracy" (page 27).

Again on the outside leadership, Bruce Millen has been extremely fair, if not outright charitable: "...to hold that the outsider is only a political opportunist is an oversimplification. Many of the intellectuals working in the trade union field are motivated by a sincere regard for the labour movement. It is obvious that many others entered union activities to build a political force—but not necessarily with sinister intent. And among the leaders who stem from the earliest organising years, a good number were probably not much aware of the political benefits to be derived until after the event. The unions, and the union leaders, often had political responsibility thrust upon them...In any case it seems clear that the members of this educated elite, whether they are outsiders as in Asia or quasi-insiders as in Africa, have fallen heir to union leadership largely because they spoke the language of the foreign colonial officer and the foreign businessman...Their education made them conversant with the modern technical and political concepts being introduced from the outside. They were an essential link between the administrator-employer group on the one side and the workers on the other, and they were needed as well to interpret events and institutions deriving from a foreign culture" (page 29).

Millen has dealt at some length with the problems arising from India being a multilingual State. He has gone out of his way to say: "Gandhi, in his attempts to foster Hindi as the national language, could not be understood by the majority of his audiences in South India". In support of this, Bruce Millen gives an interesting footnote, saying how the INTUC published in the first instance a full Hindi version of its English journal, *The Indian Worker*, then a truncated Hindi edition, and then finally only the English edition, as of early 1962.

It is heartening to find Bruce Millen remarking that "Top-notch labour leaders can be found in almost all of the new countries, some of them a good match for their counterparts in Europe or the United States" (page 30). Alas ! Bruce finds them too few for the job.

The history of trade union movement in India has been very lucidly analysed from the British times, and the inner conflicts through VV Giri to Khandu Bhai Desai have been very well traced. Khandu Bhai's remark has been intelligently quoted on page 35: "Society cannot allow workers or management to follow the law of the jungle." This is in support of State regulations of wages.

In commenting on the political setting with reference to trade unionism, Bruce Millen says: "...The political setting looms large...This is especially important in regard to the developing countries, where the mix of politics and unionism appears to be *a potent elixir with side effects we do not fully understand.* (page 37, italics ours)... The pressures generated by industrialisation and the consequent clamouring for recognition from formerly ignored economic groups combined to produce gradually broadening participation in the political system. (page 38)...All classes of the society are in a position to make demands upon the political and economic system to an extent never experienced in the West at such an early stage of development..." (page 42).

It is interesting to find in Bruce Millen's analysis how trade unions dominated by communists work for the economic interests of labour: "...When a union is in opposition to the government—e.g., the AITUC in India, the UMT in Morocco, and the Trotskyite union in Ceylon—it can play a more traditional role for the workers, limited, however, by legal restrictions and bureaucratic pressures."

Quoting Oscar A Ornati on Trade Unionism in India, Bruce Millen says that it is "primarily a labor movement dedicated to the establishment of a new society... With rare exceptions, Indian trade unions do not accept the society surrounding them. They are engaged in a major effort to change it. In the past, change meant getting rid of the English; now it means bringing about a Socialist state" (page 70). Quoting an Indian writer Subratesh Ghosh, Bruce Millen appears to endorse his reading of the trade union as "an instrument of social change" (page 71).

Commenting on Morris's historical analysis of trade union development in India with particular reference to State intervention in the processes of distribution, the analogy he has drawn between the Indian trade union organization and the Soviet model and the prediction that this convergence will continue, Millen is of the opinion that the only common factor between the two countries is that the determination of the wage levels is in large measure a government function (page 76). And Millen's conclusion is unexceptionable. "The economic bargaining function of the unions is circumscribed by the basic commitment to nationalism and to economic and social development under state auspices in a setting of scarce physical and human resources (page 79)...The union leaders, because of their connection with and understanding of the productive forces of a nation, are vital to development schemes; in addition, they provide the link between the labouring man and the political system. Since most of them have had some degree of formal education, and a number of them are highly educated, they are helpful in defining the elements of modernism to the rank and file of the embryo urban industrial force, which is still largely uneducated and unskilled but eager to overcome these disadvantages" (page 88-89).

About the political future of union relations in India and what outsiders should or should not do, Bruce Millen has something very important to say ; "...outside advisers should not lightly consider the disruption of existing relationships between the unions and their political partners... To promote political stability in India through assisting the healthy development of a loyal opposition seems more important in the long run than uniting the INTUC and the Socialist HMS in the name of building an anti-Communist labour front...a

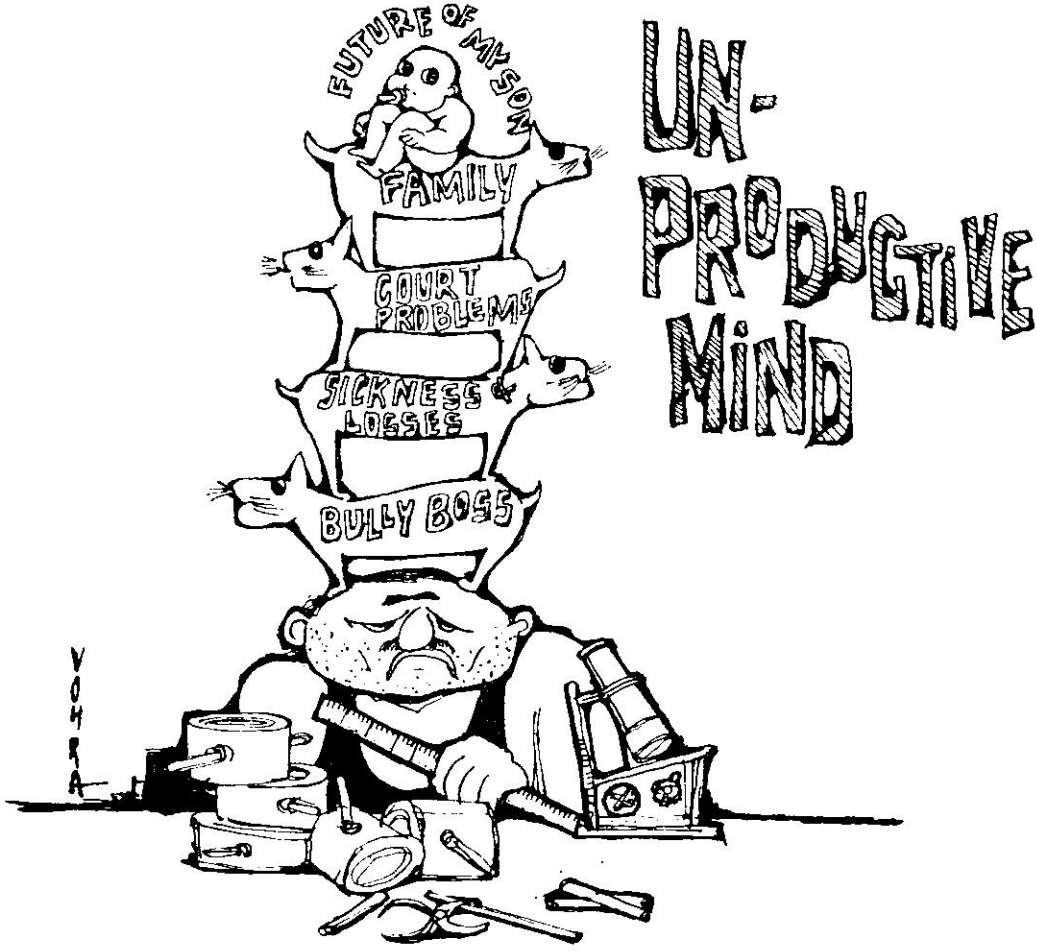
gradualist politics of the center has little merit in the eyes of the mass electorates which have come into being at such an early stage of national development...Not all of the unions are 'radical', but within each political complex they usually stand at the left of the political spectrum, making demands for better living conditions, more housing, more social protection, more this and more that...The endemic radicalism of most of the parties and the inherent drive to the left of the union leaders, while perhaps uncomfortable to live with, are not always undesirable...*The unions of the non-Communist left, as a force for modernization and development in societies with built-in obstacles to change, are, in many instances, promoting the same type of change that the West itself desires for the new countries.* For that reason alone, Americans must learn to work with them...It has been made clear on numerous occasions that *a good many of them do not at present consider the social and economic systems of the United States notably worthy of emulation...*"(pages 133—135, italics ours).

The above represents probably the core of the advice that Bruce Millen would like to tender to men in political power in the United States and their researchers and advisers. Very surprisingly this was the same advice that used to be given by liberal intellectuals in India to their friends in the United States, as early as the forties. Frankly speaking, many of us consider it both tragic as well as futile that Americans should be concerned and above all that they should make their concern felt in the internal affairs of our country; but that cannot be helped. We have for a decade and a half leant increasingly on the generosity of Uncle Sam and when the rich help the poor they are naturally concerned about how they build their houses and furniture and about their dresses and customs and all that. The poor have got to take it and ignore it if they can. Basically the Americans are democratic, both in word and deed, and they mean well and if they have to help us and we cannot but receive their help, we have also to listen to what advice they choose to offer on matters of all kinds, including how we should eat and dress ourselves and how we should run our trade unions. This irritates, but it is part of the game and at the same time exciting, with an intellectual of the Bruce Millen type, having done a good deal of research, offering such sound advice to fellow Americans to support socialism in India as the only practical and profitable policy for the investments America has made and is making in this country: very surprising, very true and pertinent●

In Short

"...I could not be certain whether I was really rich or really poor, really black or really white, really male or really female, really talented or a fraud, really strong or merely stubborn. In short I had become an American..."

From *The American Review*, January 1967



UN-PRODUCTIVE MIND

Wage Incentive Payment Plans

WILLIAM GOMBERG [1]

The last time that I was invited to discuss the problems of the Wage Incentive Payment Plans with my fellow members of the industrial engineering profession was in 1956. This was the year that I resigned my post as Director of the Management Engineering Department of the International Ladies Garment Workers Union to take my first academic post as Professor of Industrial Engineering at Washington University in St. Louis, Missouri. I looked up the paper I presented at that time. It appeared in the proceedings of the Seventh Annual National Conference of the American Institute of Industrial Engineers. I also looked up a paper which I presented before my colleagues of the National Academy of Arbitrators at their national meeting in 1957. This was my first year in academic life. By now, I have had an opportunity to acclimatise myself to the academic environment. In rereading these two papers delivered at that time, I was seeking an answer to the unvoiced question: How do I see things today, compared to the way I saw them at that time ..I might begin by making this observation that I see no particular virtue in upholding consistency and protesting no change of mind. It would, indeed, be strange to boast that I had managed to learn nothing in all these years. Well, a comparison is in order.

BEFORE I BEGIN, I MAY ADD A WORD ON the change that I have seen develop among my fellow engineers. Time study, rate setting, and their application to wage incentive payment plans have yielded their central position in the engineer's focus of attention to areas that are considered much more challenging. At that time, I recall, that time study techniques remained largely intuitive. The statistical point of view was largely rejected as over-intellectual and high brow, but it was beginning to gain a following. Growing sophistication in the use of statistics and a knowledge of its power have led to its extension to other fields of endeavour. Statistical Quality Control has yielded to more sophisticated concepts of Reliability Systems. Assembly lines are analysed by queuing techniques. Operations Research and Simulation tools have enlarged the opportunities of the industrial engineer and he is, today, equipped with a much more rigorous training than his predecessors.

Along with the displacement of the engineer's focus of interest away from time study techniques has come the widespread application of servo mechanisms using the feed-back principles so that today a highly repetitive operation is a signal to a plant manager to substitute an electronically controlled feed-back mechanism for the worker. *Automation has made many a time study engineer as obsolete as his work simplification devices once made the highly skilled worker superfluous in many cases.* I sometimes wonder whether my contemporaries of that period have learnt to accept their obsolescence with the same grace with which they counselled the workers not to interfere with progress! Of course, I am talking about the more sophisticated areas of our industrial activity. There are more than enough

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factories where the old-fashioned time study techniques are still required to set rates on industrial operations[2], where the installation of a wage incentive payment plan still elicits the same questions which we asked, close to a generation earlier. It's time to take a look.

I will, therefore, examine the design of the wage incentive payment plans and the methods of establishing the underlying production standards to determine what new material has appeared since 1957. In order to obtain an objective view of what has been happening, I should like to refer back to the paper prepared in 1957 for presentation before the National Academy of Arbitrators, in which it took the point of view of my new status, that of the arbitrator.

The principal problems faced by arbitrators arise generally in disputes over the setting of the production standards underpinning the wage incentive payment structure. These problems are closely related in their treatment to disputes over work load problems in day work factories. This relationship was graphically brought out in a dispute between the Westinghouse Corporation and the International Union of Electrical Workers. The company was attempting to set production standards for maintenance workers on time work. The Union stated its position as follows:

> The IUE maintained, at the time, that no work standards should be imposed by Westinghouse on its employees unless the job is put on incentive. The union maintains that to impose work standards without incentive is to create third class citizenship among Westinghouse workers. Day-workers on standards would have all the disadvantages of day-workers (in that they would get no incentive pay) and all the disadvantages of incentive workers (in that they would have to work against a standard).
>
> The company would have a one-way street on this. It claims it can discipline or discharge those who do not meet the standard, but would provide no extra pay for those who exceed it.
>
> We maintain that this is not only an unfair and unworkable programme but, in fact, it is contrary to the generally accepted best practices in American industry.[3]

This was an interesting reversal of usual positions where it was the union instead of the management that was demanding the extension of the wage incentive payment plan. To be sure the issues were much more complicated than stated here. They were confused by the feelings of threatened status of maintenance workers who were now to be subjected to time studies like ordinary production workers but this basic reversal did emerge.

In reviewing the problem that the arbitrator faces, my intention is to confine myself to the problem of the establishment of production standards.

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[2]Although the Labour Department estimates that the proportion of workers on wage incentive payment plans fell in recent years from 30 per cent to 27 per cent, this nevertheless represents a large enough proportion of workers to justify attention to the problem. There seems to be a cycle in which the same number of workers who are taken off wage incentive payment plans are replaced by others who are put on wage incentive payment plans. What probably happens is that after the plan goes awry, the management buys back the plan from the workers. Simultaneously another management is selling a new plan to workers hitherto on time work. If, however, we confine our attention to the more sophisticated sectors of industry, there is little doubt that *an increasingly sophisticated technology is taking control of production out of the hands of the worker and converting the worker to a monitor of automatic production or replacing him completely with a transfer machine.*

[3]Position Paper, IUE, November 25, 1955.

When labour first raised the problem of setting of production standards within an incentive payment plan of reference, it found itself confronted by two concepts with which it had to deal. The first was the concept of *extra* pay for *extra* work. The second was the concept that production standards were based upon scientifically discoverable facts and therefore non-arbitrable. The generally accepted definition of wage incentive payment plans is as follows:

> An incentive wage payment plan is a method of wage payment by which workers receive extra pay for extra production. In establishing wage incentive plans, consideration must be given to (1) the base rate for the job, (2) the amount of work required to earn the base rate, and (3) the relationship between extra work above the base and extra pay for the extra performance.[4]

Most plans at their inception called for worker lost time, caused by machine or production breakdowns over which the workers exercised no control, to be compensated for at the base rate of pay. The movement has been away from this practice. Workers generally are compensated now at the average hourly rate which they demonstrated they could maintain in some defined past period.

The accepted concept was that the employer was responsible to the worker for his base rate as long as he was in the factory; that *the premium payment for extra production was more in the nature of a reward than an obligation.* That is now changed.

Wage incentive payment plans might more properly be renamed "production wage plans" to describe the new relationship. An implicit contract obligates management to furnish an opportunity to the work force to earn a specified hourly wage at a specified pace. The worker in turn obligates himself to meet the production standard which is agreed upon.

If either party fails to meet his obligation, he suffers the consequences. In the event of a breakdown in the production organisation, the management must pay the worker the average wage. The worker, unless he meets the standard, receives less than that wage.

This approach is to be recommended for more than rhetorical purposes. It resolves the question of normalcy by making it an equitable concept rather than a rigid artificial scientific concept.

The arbitrator's approach to the problem of work standards puts it in the same realm of discourse as hourly wages. *There is no more a scientific work standard separate and apart from a concept of equity than there is a scientifically set hourly wage. This approach puts the technician in his proper place.* He is an expert advisor to the principals. This point of view frees both parties from what John Commons used to call the tyranny of the expert. This tyranny, perhaps, best expressed itself in the Louden doctrine of the non-arbitrability of production standards. Louden advised management "...A standard must be based only upon facts and changed only by facts; therefore standards must not be subject to negotiation or arbitration in their establishment or in their change"[5]

Even in those cases where management was strong enough to impose the Louden doctrine of non-arbitrability, the logic of events imposed a change. For example, the agreement between the Ford Motor Company and the UAW has specifically made the setting of production standards a

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[4] *Incentive Wage Provisions: Time Studies and Standards of Production*, U. S. Department of Labour, Bureau of Labour Statistics, Bull. 908-3, p.1, 1948.

[5] J. KEITH LOUDEN : *Wage Incentives* (John Wiley and Sons, New York, 1946), pp. 161, 162.

management function. Eventually there was a strike over an alleged speedup. Harry Shulman, impartial chairman of the three-man arbitration panel, in the course of the majority decision, defined and distinguished the nature of the right to set a production standard from other rights. He wrote:

> ...The "right of the company" (to establish, determine, maintain, and enforce standards of production), which is "fully recognized", is not a right to make a final and binding determination. It is not like other "rights" specified in Article IV, as for example, the right to "decide the number and location of plants" or the "products to be manufactured" or the "schedules of production" or the "starting and quitting time." As to these matters, the company may make *final* determinations which the union must accept for the term of the contract and which may not be made the basis of strike action during that term. Such is not the case with respect to production standards. There the right "to establish and determine and to maintain and enforce" is more in the nature of *a right* to initiate...[6].

What is particularly amusing about this concept of the non-arbitrability of production standards was the eventual use to which it was put by the United Auto Workers. The original agreement between International Harvester and the Automobile Workers permitted the latter no voice in the setting of production standards but allowed the union to strike over the issue. The clause was originally inserted, probably, because it was assumed that the union would never develop the power to exercise this right effectively. In 1955, the union found this right to strike so attractive that it endured a long drawn out strike in order to preserve it.

This time it was the company that was demanding that incentive disputes be resolved by arbitration. Finally clause twelve of the new agreement between the parties compromised the issue by leaving open either route at the discretion of the parties.

At this time, we can take it for granted that the *pace setters of American industry. by and large, have accepted the concept of the arbitrability of production standards.*

Let us now review this problem of setting standards of production. Industrial jobs may be classified into the following categories :

1. Completely man-paced jobs
2. Jobs that are made up of a fixed machine cycle and a man-paced component
3. Completely process-paced jobs
4. Jobs where man-pace and production are unrelated.

A set of typical man-paced jobs would be bricklaying or sewing machine operating.

Jobs that have a fixed machine cycle and a man-paced component are found in the metal cutting industries where the setup time and clean-away time are generally small components of the overall time dominated by the fixed machine cutting cycle.

Completely process-paced jobs are those found on the automobile assembly line and the textile industry.

Jobs where man-pace and production are unrelated are found in highly automated factories where the worker is a watchman or maintenance worker on automatic equipment.

Obviously the most critical type of job to treat is the 100 per cent man-paced job.

[6] *Ford Motor Co.*, 12 LA 949 (July 1949).

The solution to this problem would at once make the task of treating the other three types of jobs that much more simple. How can an arbitrator go about setting an equitable rate when the parties come to him with a dispute?

This is one area where the usual bromide offered to the arbitrators, that "it is your job to interpret the contract, not to write the contract," is not particularly enlightening. All too often the parties find themselves on a hook because problems arise that are completely unforeseen or could not be spelt out operationally. The false assumptions about the dynamics of worker motivation that both parties made when they wrote out the contract come back to haunt them when the operating reality of the plan shows altogether different results than they assumed when they agreed to a plan.

For example: I have seen three inconsistent clauses in a contract: The first will declare that the piece rates shall be set to yield an average earning opportunity of 130 per cent of base. The second, that the piece rates shall be consistent in their yield. The third, that no rate cut shall take place as long as the material and equipment remain unchanged.

Now the plan is permitted to operate. What happens? The rates are set on a specific line of operations. The men really apply themselves and the rates in the plant average 150 per cent of the base. Have the initial rates been set too loosely or are the men giving an extra increment of effort beyond what should be expected of them?

The arbitrator has to answer this question when new lines of merchandise or new operations come up for review and a dispute breaks out between the men and the management whether or not they are entitled to be rated at 150 per cent of base or set back at the same effort level to 130 per cent of the base. The agreement, more often than not, will provide little guide to the arbitrator. It will piously state that incentive payment plans are extra pay for extra effort. There, no doubt, will also be the usual statement that a fair day's work is expected of the men. It is defining this level that is the most troublesome aspect of the arbitrator's task.

The nature of the task faced by the arbitrator was spelled out some years ago by one of Frederick W. Taylor's associates. His name was Carl Barth. He was no friend of collective bargaining. In fact, when he was questioned about his attitude towards treating with unions, he exclaimed he would have nothing to do with them for the same reason that he does not treat with the devil. Yet his deep knowledge of time study led him to observe as early as 1922 that—

> ...It is hardly conceivable that two time study men, however well equipped by training and experience and with physical means, would arrive at exactly the same time allowance for any job each might in turn be independently assigned to study. And still, the time allowance of either would be undoubtedly fully satisfactory for use in establishing a fair contract between the worker and the management, though the two would not be identical.[7]

Now this description of the standards setting process is much more modest than the advice of Louden.

The approach of Barth indicates a range of measurements within which disagreement may take place and call for the services of an arbitrator.

It very often happens that the percentage disagreement between labour and management is less than the reliability range of the measurements of the time study technician, and the time study technician can contribute

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[7] *Symposium on Stop Watch Time Study*, p. 108, 1922.

little to the solution of the problem.

In 1957, I wrote that students of industrial engineering have proved that if one of the microscopic motion time study systems is true, then all the others must be false. They give mutually contradictory results. My own attitude has undergone some change since this was written.

The new material that I have seen since 1957 is the series of papers that followed in the wake of the reported research of Heinz Schmidtke and Fritz Stier of the Max Planck Institute for Work Physiology, Dortmund, Germany.[8] A series of seven carefully performed experiments led the investigator to conclude that *the times required to perform a sequence of motion elements are directly dependent on each other*. Furthermore, they claim to have proved that *the elemental times are not constant, that they are not mathematical quantities which may be added or subtracted* without hesitation.

Now, of course, it is relatively easy to tear down a system and, as a much younger man, I derived a good deal of satisfaction of proving how incorrect my fellow professionals were. I received my principal aid from the kind of counter attack I could expect from the Predetermined Time Systems advocates.

Three typical replies to Schmidtke and Stier are given by Gerald B. Bailey of the Woods, Gordon and Company, Toronto, Canada; by Clifford Sellie, President of the Standards Engineering Company; and by John B. Taggart, associated with the Work Factory Company.[9]

Running like a red thread through these articles were the assertions that the two German Scientists did not have the experience or credentials to apply the B.M.T. and Work Factor Systems.

I think that Harold O Davidson has given Messrs. Schmidtke and Stier the most intelligent reply and defended the predetermined time systems on much sounder ground than the two authors associated with selling their system.[10] Drawing a distinction between operational validity and scientific validity, Davidson stated that a "system for establishing time standards is operationally valid if it enables the achievement of desired goals in an economically and socially efficient manner." He goes on to point out that "the wage payment function encompasses within the system not only the work measurement technique but . . . those elements of the collective bargaining process that are operational in the correction of errors" in the application of the technique.

In other words, Davidson is making use of the same idea first postulated by Carl Barth which has been quoted earlier, updating the language to include the currently fashionable concept of "system."

Nevertheless it appears that these systems can be much more useful than unionists are willing to acknowledge but for a very different set of reasons than those advanced by their advocates.

I share Davidson's opinion that the purveyor of such techniques and trade associations linked to a brand-name parading as research associations can hardly constitute an objective court of inquiry; nevertheless, the techniques they offer perform a useful function.

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[8]**HEINZ SCHMIDTKE & FRITZ STIER:** "An Experimental Evaluation of the Validity of Predetermined Elemental Time Systems,"—*Journal of Industrial Engineering*, Vol. XII, No. 3 (May-June 1961), pp. 183-204.

[9]See **CLIFFORD SELLIE & JOHN B TAGGART** comments on, "An Experimental Evaluation of Validity of Predetermined Elemental Time Systems,"—*Journal of Industrial Engineering*, Vol. XII, No. 5 (November-December 1961), pp. 422-427.

[10]**HAROLD O DAVIDSON:** "The Validity of Predetermined Elemental Times,"—*Journal of Industrial Engineering*, Vol. XIII, No. 3 (May-June 1962), pp. 162-165.

Therefore, unless any one of these specific techniques is included in the agreement, it would be unwise to make any one of them the final measuring rod against which to measure the standard.

The Steel workers did include in their agreements with United States Steel Corporation a provision that workers were expected to maintain a working rhythm equivalent to a walking pace of three miles per hour. This never came to mean very much. It was predicated upon a school of *time study thinking in which pace is kept separate and distinct from method.* Actually production speed is an interdependent complex of these two dependent variables. The variables are impossible to separate to any significant extent. What is more important, the transferability of a walking pace to the various working paces is virtually impossible to effect. The clause, therefore, could not be very meaningful.

On the other hand, where there is a macroscopic system of standard data in use, the job of the arbitrator is made that much easier. Although the elements may not be exactly additive in any combination, nevertheless, their very existence acts as a stabiliser on the working environment and provides an emotional climate that encourages settlement of disputes.

Likewise, film records of typical operations in the factory, which both labour and the management have agreed are to serve as keys to rating, can be very helpful, if available.

The principal difficulty of the arbitrator in these rate disputes is how to extrapolate to the new operations the same equitable sense of effort that was expected on the old operations. His decision, of necessity, may be an unskilled approximation that in the future will encourage the parties to come to a rational settlement of their own. Inasmuch as it is the arbitrator's purpose to make his function obsolete, even this too will serve a useful purpose.

Most rate-setting procedures are predicated upon the assumption that a worker should be judged in terms of a theoretical effort expended uniformly throughout the day. His actual working procedure, of course, will vary with his temperament and his disposition. Some like to accumulate a large bank of work early in the day and then coast the rest of the time. The number of patterns of work varies widely. Walker and Guest[11] have described them in detail. It is the battle of the assembly line. However, he is to be left free to determine this pattern for himself, provided there is no interference with the working of the assembly line.

The myth of uniformity protects the worker and cannot be used by management for its purpose. This was brought out in the Ford case. The company had distributed jobs along the assembly line. Technical limitations dictated that all of the jobs were not uniform in their demands upon the worker. Some stations would carry a 50 per cent task, others a 90 per cent task, and still others a 95 per cent task. Obviously the speed of the line was dictated by the bottleneck operation. The company attempted to speed up the line. This meant that certain jobs would be in excess of the firm's determined 100 per cent. The company argued that it had the right to do this because the rate of work was the amount of total work achieved in a full day; that random delays, to which the line was subjected, compensated the man over 100 per cent for his extra effort. The arbitration commission again ruled that if the company wanted to run the line in excess of any member's 100 per cent rate, then it had to bargain out some compensating deal to which the worker would consent. The rate, therefore, was determined to be a rhythm from minute

[11] "The Worker on the Assembly Line," CHARLES WALKER & ROBERT GUEST, *Harpers*, 1955.

to minute rather than a sum of work over a day.[12]

Problems such as these have led more and more employers to take a new look at the wage incentive payment plan. The Kaiser Steel company was plagued by a badly administered wage incentive payment plan that covered 42 per cent of the entire work force. Following the steel strike of 1959, after the firm had broken away from its associates and signed an independent agreement with the United Steel Workers, one of the key provisions called for the creation of a special committee to act as consultants to both the union and the management. Under the leadership of this commission, the management and the union devised a new plan in which the workers would participate in the cost savings, generated over a period of time.[13] In return the wage incentive payment plan was abandoned. It had become a continuous source of friction for the following reasons. Loose setting of standards had led to wide disparities in earning opportunities on different jobs. In addition to the jealousies, generated within the incentive group itself, there was widespread resentment between the incentive group who were making substantial, if unequal, increments and the remaining 58 per cent of the workers, also members of the union, who received no bonus increments at all. A cost saving sharing plan was substituted which provided for the division of the cost saving increment among the entire work force. It is important to remember that this was not a profit sharing plan but a cost savings plan. In a sense it resembled the older Scanlon plan with some differences. A $75,00 payment has been made for the first month of the plan's operation to all workers. The worker gets very substantial protections against layoffs through participation in a labour pool so that he need not fear working himself out of a job.

12 Ford Motor Company, 12 LA 949 (July 1949)

13 The detailed plan may be obtained from Kaiser Steel Company: 'The Long Range Sharing Plan'.

I have purposely refrained from going into great detail about the mechanics and statistics of the plan lest it be interpreted as a model to be imitated in detail. The important consideration is that it represents a trend that may revolutionise the methods of resolving disputes between labour and management.

We may summarise as follows:

The central problem in the determination of most wage disputes under wage incentive payment plans is the dispute over the production standard. The determination of this standard for 100 per cent man-paced jobs is critical. Once it is solved at this level, the solution for less than 100 per cent man-paced jobs becomes that much easier.

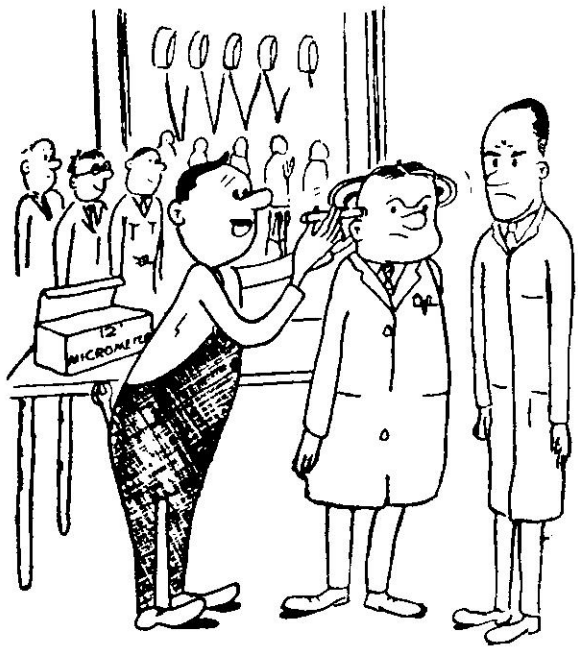
The concept of the uniformity of rate is critical in machine-paced operations. *The setting of the production standard is a problem in equity.* The function of the expert and the engineer is to aid the laymen to extrapolate this concept of equity from old jobs to new jobs.

The determination of what production level achieves a sense of equity is not the monopoly of the expert but the task of the principals to the bargain, aided, if needed, by the arbitrator.

Engineers are primarily useful to set up a rational range within which the principals can bargain. It is the function of the arbitrator to help the parties overcome the barrier when the collective bargaining process grinds to a halt.

Yet, when all is said and done, *the future of the profession lies in those areas where time and motion studies are and the wage incentive payment plans derived from them are becoming increasingly obsolete.* The Kaiser agreement and the creation of a human relations committee in big steel portends a new kind of collective bargaining. Where, before, the mechanism could be described as

gamesmanship in which challenge and response dominated, we now seem to be moving in a direction where the term agreement is likely to be replaced by a new industrial government with or without the participation of third parties. In short, the kinds of problems now faced by participants in the collective bargaining process is to create a permanent industrial government rather than the periodic rewriting of the terms of a truce.



" Hope you don't mind, Boss, The boys have a little bet on !"

MOHAMMED ARIF KHAN

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Non-Wage Benefits in Indian Industry

There are two alternatives for enlisting the cooperation of workers for achieving higher productivity. The first is to increase the money wage and thereby stimulate the cooperation of workers. The other alternative would be to maintain a proper ratio between money wages and non-wage benefits. It is a well-known fact that in India excessive reliance has been placed on money wages alone and, an increase in them is considered an adequate incentive for raising productivity. Since the increment in money wages has failed to keep pace with rising prices, there has been a tendency on the part of workers to regard wage increases as a partial compensation for the price rise rather than as an incentive for raising productivity.....In such a situation, the desired objective of increased labour productivity cannot be achieved unless some other incentives, apart from money wages, are also offered. Housing, clothing, part payment of wages in kind, holidays with pay, subsidised canteens, sports and games, educational facilities for the children of the workers are some of the typical instances of non-wage benefits which would raise labour productivity.

IT IS AN IRONY OF FATE THAT THE EFFECTIVENESS of non-wage benefits as a factor of increasing labour productivity has not been realised fully in India. Being provided with insufficient purchasing power in a market where they are powerless to bid for an adequate supply of foodstuffs, the workers feel particularly the deprivation of a number of non-wage benefits of which they are keenly aware.

Experience of foreign countries, particularly the UK, the USA and Japan has shown that non-wage benefits have played an important role in raising labour productivity. In the UK, for instance, most of the "welfare-minded" companies with the best fringe benefits have a higher than average level of labour productivity[1]. A survey of US industries conducted by the International Labour Organisation[2] disclosed a high degree of positive correlation between non-wage benefit schemes such as subsidised food and canteens and labour productivity. A study conducted by UNESCO on "Social and Cultural Factors affecting the productivity of Industrial workers in India" has emphasised the role of non-wage benefit

[1]Ried, GL and Robertson, DL., (eds.) *Labour Cost, Fringe Benefits and Social Security* (London: Allen & Unwin Co., Ltd., 1964) p 322.

[2]*Nutrition in Industry* (Montreal: International Labour Organisation, 1946) p. 84.

schemes for raising labour productivity[3]. Although, the study could not measure the impact of specific items of non-wage benefits, it has, neverthelesss, emphasised the role of housing, subsidised canteens, schools, hospital facilities, and bonuses, as important factors for increasing productivity.

The case study of Hardoi Sugar Mills and some other sugar mills of Uttar Pradesh, recently undertaken, can be cited as an example showing a favourable impact of non-wage benefits on labour productivity[4]. The employers of these mills have given certain non-wage benefits which have influenced labour productivity to a considerable extent. Due to non-wage benefits alone, 162 hours were saved in a single crushing season. Production targets of the firm were achieved before time, alongside enhancement of workers' earnings and greater enjoyment of non-wage benefits. It is the author's thesis that this argument applies with equal force to practically the whole range of Indian industry.

Non-wage benefits can go a long way in increasing the productivity of labour in Indian industries by creating a sense of belonging with the employing organisation. Indeed, the relationship of the workers and the management based on merely money wage bills, has built a wall, invisible yet strong, segregating them into two distinct and identifiable groups. Non-wage benefits, on the other hand, being humane in character, create a feeling among the workers that they are personally looked after by the management. Despite their personal worries, they own and accept better ideas and instructions, cooperate willingly, save upon wastages, take pride in their performance and thus produce more. Through non-wage benefits an attitude develops in workers to do more than what is expected of them: these attitudes are developed and not superimposed or purchased by money wages alone.

The benefits of increased productivity flow not only to the management, as it is generally supposed, but the workers also find their further share in the shape of good wages; and improved standards of non-wage benefits tend to bring their standard of living to a respectable level.

As productivity continues to rise, management and workers may choose to take their gains through a reduction in working hours: shorter hours of work, holidays with pay, and increased leisure. A part of the increase in non-wage benefits may go to wage earners in the form of social services. There has been a continuing trend in practically all the advanced countries towards shorter hours, increased social services and many other non-wage benefits, which are the blessings of increased productivity. In the absence of a comprehensive programme of non-wage benefits, *increased productivity will remain a dead slogan.*

[3]A recent study conducted by the UNESCO has mentioned these and other factors affecting the productivity of industrial workers in India (UNESCO Research Centre, Delhi: *Social and Cultural Factors Affecting the Productivity of Industrial Workers in India*).

[4]*Ind an Journal of Labour Economics*, Lucknow, Vol. VI. No. 4. The case study substantiates the claim of enlightened sugar companies in U.P. that non-wage benefits have had a favourable impact on the efficiency of their workers and in the maintenance of better industrial relations (See Khan, M,A., Non-wage Benefits *in the Sugar Industry of Uttar Pradesh*, Ph. D. thesis, submitted in the faculty of Commerce, Aligarh Muslim University, Aligarh, 1966) p. 216.

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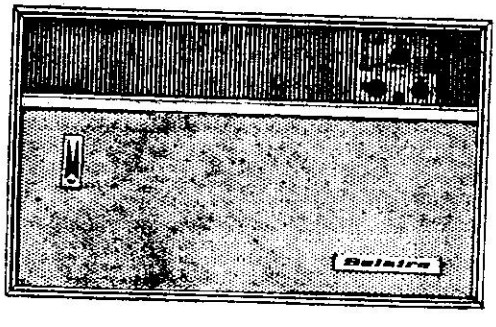

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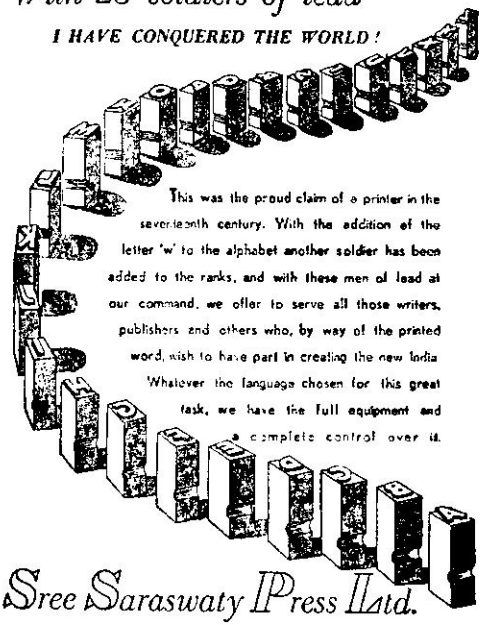

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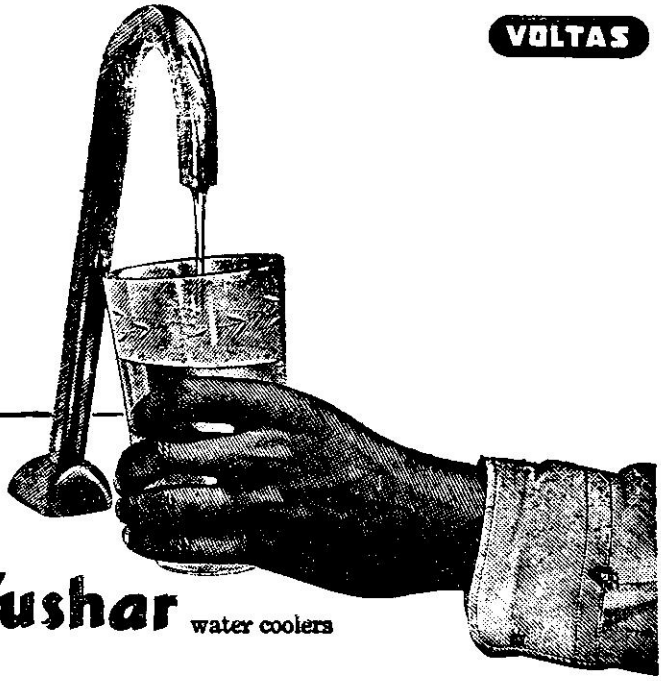

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Materials Handling*

RF Bruckart

To write on Materials Handling is really to deal with one of the most obvious inefficiencies in India's way of doing things. The author, a distinguished intellectual who worked for NPC for several years, not only feels it that way, still more strongly, he considers it a most serious problem of the human spirit.

IN THE FIRST INSTANCE, INEFFICIENT materials handling is expensive. We can demonstrate the cost of inefficient materials handling, readily enough, for example, we know that in the Western countries, *the cost of human handling is approximately 250 times the cost of handling a given load using electrical energy*. Specifically, one horse-power of human energy in a Western country costs the equivalent of Rs 50, whereas a horse-power of electrical energy costs 20p. Of course, our labour rates are not so high as in such countries, but the unnecessary expenditure incurred by us in relying on the backs of men rather than on mechanical devices is, without doubt, exceedingly high.

In terms of industrial practice, it is now a *cliche* that *materials handling adds nothing to the value of a product, but merely to its cost.*

I think we should look beyond the implications of profitability, however; we should view the problem in a broader connotation. We can paraphrase this *cliche* by saying that materials handling as practised so widely in India contributes little if anything to the value of the economy, but merely adds to the cost—a prohibitively high cost expresssed not only in unnecessary waste and in inefficiency, lowered quality and lost time, but also in a degradation of the human spirit of those who are responsible for doing this task. *Ours is a society, unfortunately, where millions of our citizens are reduced by circumstances to doing the jobs of beasts of burden*—many are little more than human bullocks. This unpleasant fact, I think should form the basis for our overall policy on materials handling poblems —*this*, rather than the search for increased profitability.

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*This piece by Professor RF Bruckart has a nostalgic significance for the Editor. Professor Bruckart worked for the National Productivity Council as an American Expert, probably from the very commencement, till a few years ago when he left for another US-AID assignment in West Asia. There developed between him and the Editor—possibly because of a common professional background—an intellectual camaraderie, interspersed by fierce discussions on the nature and trend of the Indian economy. Such mutual brainstorming often resulted in certain pretty pieces being written for this Journal by the Great Professor. When he left the NPC, the Editor persuaded him to leave some choice pieces to be kept on the editorial file, for use in case of need. This is one of them. Apart from its intellectual content, it should serve to remind many of us in NPC and outside that such an American worked with us. A marked significance of this piece is that Professor Bruckart writes about India, as though he were an Indian. In paragraph 2, for example, he says, "Ours is a society, unfortunately, where millions of our citizens are reduced by circumstances to doing the jobs of beasts of burden. Obviously, emotionally Professor Bruckart got infused with the Indian Nationality.

The fact is, however, that we tend to look for solutions to problems of which we are most aware: those that strike the eye most forcefully. A widely recognised axiom has it that what we see continually we see not at all. So we learn to keep our sights high. We do not *see* men and women and children pushing and pulling and heavily burdened by loads, sometimes far beyond a reasonable capacity. To us, a worker is a coolie! We have a "blind spot" to this even if we personally are delayed and inconvenienced by having to face it. We tend to ignore those who rely for their livelihood on the sweat of their brows and the strained muscles of their backs. Yet we know that *in a modern society based on science and technology, the man who has no more to sell than his physical efforts has nothing much that that society considers of value.* Of course, we say that we are striving to build a modern society.

Our thinking on this problem is confused. We point to our long traditions of culture, of which we are rightly proud; but we ignore our equally long record of doing things in the most degrading ways, of which we cannot be proud.

Undoubtedly you have all seen in front of the Fine Arts Museum in Delhi the sculptured work by Roy Choudhry.[2] This work represents the figures of four men trying to move a huge rock. The life-sized figures grasp long wooden poles, and their bodies are twisted by the great efforts they are making to move the heavy boulder. Choudhry's work, obviously, is symbolic of the great obstacles in our lives that we must face and overcome. The title given to this sculpture is "Triumph of Labour."

I would like to suggest that an actual triumph of labour will be ours only after the real-life prevalence of such grinding physical demands on the Indian worker have been minimised—when heavy work may be done quicker and easier and better with mechanical and electrical power.

Some years ago, when still a young industrialist, the American, Henry Ford, said: "A cardinal principle of mass production is that hard work in the old physical sense of laborious burden-bearing, is wasteful. The physical load is lifted off men and placed on machines..."

Yet we fear labour-saving machines: even those of us who are educated. We are frightened to death of the very salvation that lies within our grasp. We dissemble. We keep mumbling about redundancy ...mechanisation...unemployment...rationalisation, and we keep repeating all kinds of action-paralysing words and phrases. Tremblingly we plead: "But how can we *afford* mechanical handling methods?"

This is a *critical* question, but in my opinion we are asking the *wrong* question. We are not thinking clearly. I am sure we know we *must* improve our methods of materials handling. *We cannot pretend to be competitive industrially in the twentieth century using the methods of two or three centuries ago.* If we are armed only with obsolete tools and old-fashioned equipment, we can never achieve a modern industrial society. Although we have extensive industrial programmes, yet I think our progress in improving our materials handling efficiency is slow.

We need a new approach. We should re-phrase the critical question: so we need not ask it in fear and depression!... not to ask "How can we *afford* mechanization?"—but, instead, "When we go ahead and *do* mechanize, *as we surely must*, what human problems will be created? What is the best way of solving them? How can we protect the interests of those who will be affected? What aid do we need in handling *these* problems?" These, I think, are the

[2]This was featured on the cover page of the Special Issue of this Journal on Labour & Productivity, Vol. IV, No. 3.

challenging questions we must ask. And they may be asked with dignity, and with a confidence that they can be answered. These are positive questions that go to the heart of the materials handling problem. To be sure, to come to appropriate answers will require an imaginative and intelligent approach to the problem. Yet this, in my opinion, is well within our capacity if we will it so.

I think our attitude must be like that suggested by a cartoon that appeared some time ago in an industrial journal. A supervisor is shown with his hand on the shoulder of one of his workers who seems to be depressed, and is advising him: "*Quit worrying about automation and show some animation.*" I am confident that we have all the intelligence and analytical ability to solve our materials handling problems—*if we devote ourselves to the task!* We have no absolute need for foreign advisors in this field. If our success in improving our performance in the handling of materials is yet very little, *it is because we have not applied ourselves to the problem vigorously enough.* Our approach has lacked dynamism.

This is a serious default. I think there has never been a greater need in our long history for improved materials handling than now. The success of our industrial programmes may depend on it—and the welfare of millions of our citizens will be influenced by it. What greater incentive do we need to bestir ourselves in this endeavour ?

"I'M WRITING A BOOK SEE THAT IT'S A BEST SELLER

Productivity Measurement

Paresnath Chattopadhyay[1]

The concept of productivity has many facets and each of these facets has several knots and involvements of its own. Evolving from necessity, different types of requirements of management have been reflected in various emphases in the measurement of productivity—(i) aggregate productivity in regard to factor inputs as well as to the different standpoints like the unit as a whole, the industry, the sector of industries and the national economy as a whole; and (ii) factor productivity in regard to the different factors of production like materials, labour and capital from the point of view of the unit, the industry, the industrial sector and the national economy—so that the nomenclature of labour productivity relates to only one of several phases of productivity measurement.

THE CONCEPT OF LABOUR PRODUCTIVITY suffers at present from a sort of deceptive simplicity. Indeed, the conceptual aspects of labour productivity have remained outside the bother of those who are rather immediately concerned with it. To be sure, Professor J.W. Kendrick[2] has accused the American managements of indifference to the question; in this country, the condition is far worse. The consequence of this gap between theory and practice is that at the plant level, the full potential of this approach still remains unexplored. Managements generally look upon this approach almost with suspicion arising from the reservations as to the accuracy of such measures and the uses to which these can be put in day-to-day problems. The doubts of management are not entirely baseless because these measures admit of several ambiguities of different kinds. Backed by a hair-splitting discussion of abstract logic these ambiguities give rise to an almost deliberate opposition against this approach.

Diagram I (page 234) shows the implications of productivity rise at different levels and in different ways. The benefits accruing to the different factors e.g. wage, profit, interest, investment and employment, and cheaper goods, may be in different proportions admitting of, for instance, a wage rise, profit rise and cheaper goods at the same time; the difference in the proportions is emphasised to make it clear that these benefits need not always be in conflict. This has to be clearly understood at the outset. *In what exact proportion the benefits of higher productivity are to be shared is a matter of decision as to*

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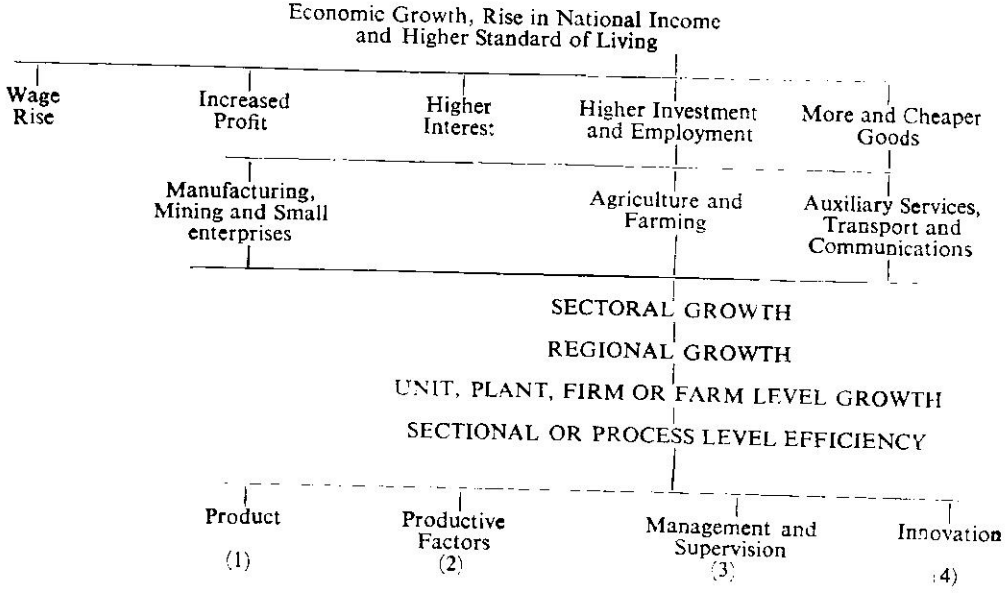
[1]Professor, Indian Institute of Foreign Trade; formerly of the Department of Business Management, University of Delhi. These are personal views of the author.

[2]See J W. KENDRICK & DANIEL CREAMER: *Measuring Company Productivity—with case studies.*

DIAGRAM I

Implications of Rise in Productivity



whether the objective is to maximise welfare, growth, investment or employment.

Note : The benefits of higher productivity are in different shapes as given above. The proportion in which the benefits would accrue to the different factors may be different in different cases. All or any of the above consequences may follow a rise in productivity.

(1) Product-choice, product-design, product-use and product-mix.

(2) Fuller utilisation of the available resources; factor balance and factor-proportions will be underlined in this connection. This question is relevant in all cases whether the capacity utilised in terms of technical factors is 90% or only 60%; even when a unit is working at say 100% capacity in technical terms, individual factors may be under-utilised : there may be surplus labour, surplus capital or surplus managerial resources.

(3) Management and supervision as factors of production should be adequately underlined in this connection; their influence on production cannot be accurately measured in terms of quantum of output.

(4) Innovation is reflected in terms of technological changes, improvement of lay-out, design, attitude and distributional methods, among other things.

In most input-output analyses stress is necessarily given on the two measurable inputs, namely, labour and capital. While this is understandable, such analyses can hardly be claimed complete, in view of the fact that output is a joint function of all the factors of production and to disaggregate the individual factors is a problem in itself. It is, however, essential to remember that

the attempts to quantify the various factors are admittedly tentative, though not totally unpurposive. Our discussion below should, therefore, be taken in the light of the foregoing pointers.

Diagram I shows the level for which productivity can be gauged, admitting of various degrees of abstraction. If we start from the bottom upwards as shown in the diagram, that is, from the plant level to the national level, the need for abstraction and aggregation of divergent factors will be clearer. At the plant level itself there are such problems of aggregation because of the diverse ways of measurement of production in different sections involving different types of work done. Line and staff sections should be distinguished in this context; even in the line sections, services such as maintenance should also be taken account of in proper light.

In the circumstances, the formula suggested by the British Institute of Management may be considered for its relevance:

$$\text{Plant Productivity} = \frac{\text{Production in Units Value or Standard-hours}}{\text{Total Man-hours or Planned Machine-hours}}$$

Alternatively, this formula can be stated as output per unit of labour input or capital input. The B.I.M. states that in case the depreciation and maintenance charges of the machines are greater than the wage bill, it is preferable to apply the Planned Machine-hours. In most cases, this measure is stated to be an indicator of labour productivity but in underlining that machine-hours may be a more useful guide, in case the relative capital intensity makes the man-hour base obscure for management purposes. The B.I.M. attests the point that what is being measured is not labour productivity as such but total productivity or productive efficiency, over a particular period of time. The ratio derived from the above formula thus fails to convince as an absolute measure. In fact, a number of misgivings arise because of the misunderstanding as to the meaning and implication of the term productivity and the part labour plays in it.

Is labour productivity a misnomer then? Our contention here is that the answer is at once *yes* and *no*.

Labour productivity is a misnomer as an absolute measure insofar as it is practically impossible to segregate the exact part labour plays in the output. Measured this way, the influence of the other factors is also largely shadowed. Though it may be possible to measure the contribution of labour in purely manual work, the complicating factor is the functioning of the *organisation* as in itself a unique factor of production. *To assume this factor away as economists do in many cases, is to ignore the reality* and to make the analysis largely academic. Why then labour should be used as a denominator? The current literature on the subject does not seem to have offered a convincing reason yet. An article in the *International Labour Review*[3] assigns the following reasons :

1. This basis satisfies the sense of attainment in human beings as human beings. In most countries of the West, labour being scarce, attention naturally focuses on labour; trade unions are also a factor to reckon with in this context.
2. Data on the basis of man-hours are more readily available than any other input factor.

Both these reasons are unconvincing. The essence of productivity relates to the economising of what must be a scarce factor. It would be a waste of resources to attempt to economise an obviously abundant factor. If this basis is accepted, then in this country, it should be capital rather than labour that should be the focus of attention in Productivity Measurement; more than both of

[3] July 1957.

these, it should be organisation. The misgivings that arise, mainly as a result of the confusion, relate to labour's pressing for wage-geared approach to work, manifest in terms of productivity-geared wage; bonus based on profit; and a disincentive to raise capital-intensities in industry. There are a number of external push and pull factors,[4] interacting on productivity of the factors of production including labour. The compelling labour laws and the general attitude of Government towards labour exert a good deal of influence on wages so that wages have ceased to be purely a question of Labour Economics. The Industrial Courts have viewed this question as a matter of pure equity, often ignoring the standpoints of the organisational strength and of organisational continuity.[5]

Labour productivity is not a misnomer when considered in terms of changes in the ratio over a period of time. At the plant level this measurement is relatively easier than it is when the movements concern the industrial sector or the national economy. This is because at the plant level the changes in the inputs will be known more accurately and, given the initial measure, the changes can be ascribed to labour or other factors. This is, however, not possible when the measurement concerns a wider area; apart from the changes in the individual factors, the proportions of these factors also change overtime. This distinction is not usually made in most measurements of productivity. Such ratios as capital to output and labour to capital should, in the circumstances, be understood along with these caveats.

An extension of this logic would help us to understand the questions of productivity-geared wage policies better. Labour being only one of several factors of production and the exclusive influence of labour on production being not susceptible of accurate calculation, the claim of labour for an exclusive share in the gains of productivity is doubtful. Even if the changes in the wage rate on the basis of that in productivity are tenable, the absolute wage rates admit of a number of other considerations which can hardly be ignored. For example, in the determination of the basic wage or the wage scale, one has to look into the questions of a minimum level of living, cost of living indices and such other factors having a bearing on fair wages.

Further, wages are a matter of the future insofar as the determination of the rates is concerned, but productivity is a matter of the past and as such, gearing of wage to productivity results in a number of uncertainties; estimating the expected productivity is also subject to a number of caveats which bear mention in this context. Productivity increase in itself does not suggest a better profitability position of a unit. Whereas the rise in productivity reflects the internal movements of the concern, the profitability of the concern depends largely on a number of external forces, bearing on the paying capacity of the concern.

Sales, for example, depend on the demand for the goods in the market and the price realisable from the market. This factor becomes particularly relevant when producers sell in a buyers' market and there is keen competition among sellers and substitutes Productivity-geared wages may in such cases be enough reason for a concern's undoing. On this score, the claim for bonus by the workers as a part of their wages is not entirely illogical; bonus offers a device to management for adjustment between a lower wage scale than what the actual profitability would justify and the actual paying capacity that profitability indicates. Historically speaking the payment of bonus in this country would bear out this proposition that bonus out of actual profit was an

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[4] Cf "Some Reflections on the External Factors in Labour Productivity", *The Asian Economic Review*, August 1961, Hyderabad, A.P.

[5] I personally believe that these standpoints need not, at least in companies, always be linked up with the question of ownership. Cf. "The Question of Juristic Entity", *The Financial Express* (Bombay), January 2, 3 and 4, 1962.

ex gratia payment; the standpoint of equity taken by the Courts is rational on this ground. The transitional phase of the Indian economy at present suffers from a number of distortions, one of which relates to the question of bonus. The distortion is because of the fact that now bonus is not paid out of unanticipated excess profit but it enters into the price of the product for sale. In such a case, it becomes preferable to allow a general wage rise in lieu of bonus, than to allow the insidious element of profit bonus to continue.

The importance of sales on productivity can be gauged from the fact that in the cotton textile industry in this country in 1957-58 there was an acute crisis, in spite of a general rise in productivity. According to the speeches of Chairmen of a number of cotton textile companies, the reason for the crisis was that the demand for textile goods fell below all expectations because of the fact that there was a rise in the price of foodgrains and people's purse was eaten away in purchasing food. The crisis manifested itself in many ways, namely, fall in sales, losses causing closure of a number of mills and fall in prices.

We shall now be concerned with measuring productivity in its various facets, subject to what has been stated in the foregoing sections. The following diagrams would explain themselves.

Plant Level

DIAGRAM II

PRODUCTIVITY INDEX

Product (standard-hours) per hour (in terms of available clock-hours)

— Value added per hour

Product per Man-hour (1)		Product per Fuel-hour (2)		Product per Machine-hour (planned) (3)
Unit Material requirement	Unit Labour requirement	Unit Power requirement	Unit variable overheads requirement	Index of fixed overheads

Industrial Sector

DIAGRAM III

i. Productivity Index as aggregate standard-hours

ii. Index of the movement of Production in relation to employment:

$$\frac{\text{Index of Production}}{\text{Index of Employment}} \times 100$$

Aggregate ratio (1)	Aggregate ratio (2)	Aggregate ratio (3)

Unit requirements mentioned in Diagram II

The desirability of compilation of productivity data on the above bases suggests itself when the purposive character of such data is underlined. These data are not only used for the purpose of internal management or academic exercise, they are also used by the Government in different connections, particularly in the plans.

In the programmes for industrial development in the plans, a realistic appraisal of the present potential and future requirements for development and the allocation of resources in that behalf would require the planners to establish some relationships for application in the relevant projections. The

expected increases in productivity on the basis of the known relationships in the past would offer such a guide. Capital-output, labour-output and capital-labour ratios are already in use in this context. Further breaking up of the factors is here suggested to avoid bottleneck in various contexts. Adequate planning for materials and power in the context of the plans for industrial development is an essential requirement; so is transport. It, however, appears that these aspects were given less than proportionate emphasis in our first three plans: even in the fourth, one would expect a more conscious appraisal of some of these factors. The three diagrams are, therefore, considered to have some practical relevance.

We have deliberately suggested the adoption of the standard-hour base in productivity measurement. It is primarily because of the unpurposive character, in this context, of the physical product as a numerator; in even the same unit, individual product varies in nature and measure from section to section; in the industry as a whole, the variation is almost wild. In such a case, the standard hour takes account of this divergence much better than any other measure. It has been defined by the Institute of Cost and Works Accountants (London) as the output that should be raised in one hour, making due allowances for rest, etc. Since total production of commodities would in any case be known, the standard hour should offer no difficulty for the purpose of productivity calculation. In many units this is already used; in others, this can be introduced, preferably after work study. Though in terms of output, the standard hour would signify different quantities, the constancy of the standard hour would remain undisturbed.

When a product is mentioned in terms of value, the problem of aggregation manifests itself in different forms. Different products being subject to different degrees of intensity of effort, the values of the products cannot be made expressive of the intensities of such efforts. The components of cost of these products may bear altogether different proportions. Even for the same products the cost variation in the components may be different in different markets and overtime, in the same market. The fluctuations in the prices of the factors of production would tend to make the value computations of these products easily abortive for the purpose of internal management. The use of a price deflator may, at times, be made to express the product overtime in terms of constant prices but in the case of multi-product manufacture this gives rise to several complications; the price index used as a deflator may be too general and obscure to be really effective and if the unit itself indulges in constructing a price index of its own, it may be an extremely costly process and may lead to doubtful results.

The same complications arise in measuring the value added because of the changes in factor-remuneration due to various internal and external factors. Along with the other measures, however, evaluation of the products in terms of constant prices may offer reasonable indications of the changes taking place over a period of time. In this connection, it may be pointed out that value added as a concept is not in use in the company accounts or in any other document at the company level. The National Income Estimates and the Census of Manufacturing Industries or the Annual Survey of Industries, however, make use of this concept. It is necessary for the units to use this concept to bridge the gap between the aggregate and unit level computation of productivity indices. The idea of conversion cost as used in some cost records is not exactly similar to added value. Perhaps this is a part of the difficulty caused by the absence of standard terminology in this field.

We may now, in the context of the foregoing discussion, consider at length, the case of Beta Cotton Mills, whose relevant statistics are printed on page 239.

Table I

Employment

	Number of Workers		
	Permanent		Temporary
Spinning	1180	Temporary	173
Weaving	150	*Badli*	87
	1330		260
Indirect Workers	90		
Staff	62		
	1482	Total	1742

Note: The temporary and *badli* workers were employed to fill the places of the absentee permanent workers so that during the years under review there was no change in the number of workers on job. Distinction has not been made between direct and indirect workers in the productive sections under spinning or weaving.

Table 2

Production

Year ended 31 March	Yarn Lbs.	Cloth
1957	5476176	1448160
1958	5102763	1401904
1959	4920368	1373517
1960	5296271	1624722
1961	5079982	1750234

Table 3

Spindles and Spindle-hours

Year ended 31 March	No. of shifts	No. of spindles per shift	Spindle-hours
1958	2	102678	1642848
1959	2	109100	1745600
1960	2	125440	2007040
1961	2	129994	2079904

Table 4

Looms and Loom-hours

Year ended 31st March	No of shifts	No. of looms	Loom-hours
1958	2	198	3168
1959	2	203	3248
1960	2	253	4048
1961	2	274.5	4392

Note: The number of looms installed is 300, of which 100 were automatic looms and the rest plain. One worker can handle 12 auto-looms and 4 plain looms. Power consumed is 1000 kW. per hour.

Table 5

Year ended 31st March	Gross fixed assets	Plant & machinery	Net worth	(Rupees '000) value of production
	(A)	(B)	(C)	(D)
1957	21284	16127	17226	28600
1958	23666	17172	17422	31400
1959	28736	21787	18391	29900
1960	30341	23064	18949	35400
1961	32303	24327	19159	38000

These are book values unadjusted for price changes.

Table 6

(Rupees '000)

Year ended 31st March	Salary and wages	Cotton consumption	Sales Turnover
	(E)	(F)	(G)
1957	3482	18779	31613
1958	3907	21489	33508
1959	4118	19825	33040
1960	4628	23147	39270
1961	5211	23754	44043

Table 7

Productivity

Year	(1)	(2)	(3)	(4)
1957	.6	1.2	...	...
1958	.5	1.2	3.1	442.5
1959	.5	1.1	2.8	442.9
1960	.6	1.4	2.6	401.1
1961	.5	1.5	2.4	398.5

Legend :

1. Productivity per Direct Labour-hour (Spinning)

2. Productivity per Direct Labour-hour (Weaving)

3. Productivity per Spindle-hour

4. Productivity per Loom-hour

Table 8

Indices of Ratios

Year	1	2	3	4	5
1957	100	100	100	100	100
1958	98.9	103.1	108.6	102.2	104.2
1959	77.4	77.3	97.9	113.2	101.1
1960	86.9	86.6	112.6	107.4	99.6
1961	87.6	88.7	119.5	114.2	95.2

(1) D/A (Index) (2) D/B (3) D/C (4) E/D (5) F/D

Table 9

Indices of Ratios

Year	G/A	G/B	G/C
1957	100	100	100
1958	95.1	90.0	104.8
1959	77.4	77.3	97.8
1960	87.1	86.8	112.9
1961	91.7	92.3	125.3

This case study is illustrative of the possible ways in which productivity ratios and indices can be computed apart from labour-hour or machine-hour at the firm level. The spindle-hour and loom-hour productivities shown above are indicative of the management's concern for gauging the movements of each individual aspect of production, contributing to higher efficiency of the concern in its totality. This is more important when the overall results are likely to undermine the contrary movement in each of the aspects making for the results. Management approach to this question highlights the composite character of each of these facotrs.

The ratios and indices shown in Table 6 as prepared on the basis of the figures in the other tables require an explanation. The ratios in column IA and IB show diverse movements indicating a rise or fall in productivity per direct labour-hour in the spinning and weaving sections. While in the spinning section productivity has shown a fall over a period from 1957 to 1961, productivity in the weaving sections has shown a rise from 1.2 lbs. in 1957 to 1.5 lbs. in 1961. This is, however, subject to the condition mentioned in the note below Table 1, i.e., the temporary and *badli* workers have not been counted separately. These columns, however, expose the fact that productivity calculated in terms of the final product (cloth) conceals the contrary movement in the productivity of the intermediate sections. Side by side with these movements, we find that productivity in terms of both spindle-hour and loom-hour has been on the decline over the period from 1958 to 1961 as is evident from columns 7 and 8. One reading of this trend is that the looms and spindless have not been properly utilised during the period, though more of both spindless and looms have been in operation, as seen in Table 3, columns 3 and 4. In this context, it is necessary to refer to the note below Table 3, that the total number of looms installed was

300 as against the trend shown in the above table.

Columns 2, 3 and 4 in Table 6 indicate the indices of output-capital ratios, capital being signified in different ways as gross fixed assets, plant and machinery and net worth. Net worth includes only paid-up capital and reserves, not loan capital. It is because of loans having been excluded that the output-net worth ratio indices show a contrary movement in relation to the movements shown by the other two columns. The gross assets and plant and machinery show a rise of 51.8%, 50.8% respectively over the period from 1957 to 1961; whereas the rise in net worth was only to the extent of 11.2%. Apparently, part of the fixed assets and plant and machinery was financed by loans. The gross fixed assets shown in Table 6 include plant and machinery though the latter has also been shown separately.

Columns 5 and 6 in Table 6 show the indices of salary and wages and cotton consumption to production in terms of value (book value). While salary and wages to production index have shown a rise of 14.2%, that of cotton consumption has recorded a decline by 4.8%, in relation to 1957, per unit of production over the period.

From the point of view of the management of the concern under consideration, computation of any of these ratios in isolation would fail to signify the real nature of the movements in different areas within the concern. When labour productivity has increased in the weaving sections, the reasons therefor may make management trace the fact that the installation of the automatic looms is responsible rather than the increased efficiency of the workers. This can be more aptly shown if the calcualation of labour-hours takes account of the fact that the automatic looms would show production three times more than plain looms per labour-hour. Again, the production of yarn has shown a decrease over the period while that of cloth has risen. It can also be deduced that a fuller utilisation of plant and machinery is called for in spite of the rise in labour productivity in weaving. In the circumstances, the computation of labour productivity alone will hardly be adequate or purposive enough for management.

The incidence of profit and the external influence to which profit is subject has been described in Diagram IV (page 242). The viewpoint is that of a unit. The management is interested in having as accurate a knowledge of all these different aspects as possible and has to rely on both the internal systems of control and external sources of information with a view to making the profit planning reliable and realistic, adequately calculative of the expected changes and the anticipated steps to cope up with them.

The diagram is intended to show the various factors that act and interact in pushing or pulling profit up or down. The role that productivity plays in the incidence of higher profit has, in the circumstances, to be underlined in its proper context. In many cases it is not so done. At the Rourkela Steel Plant of Hindustan Steel, the management had the queer experience of having to pay production incentive in some sections to the extent of 25 per cent of wages while the plant was operating at only one third of its installed capacity. The consequence was that there was a heavy drain on its resources and the loss was colossal. The incentive system, in this case, proved spurious. The need for an objective view of the organisation as a whole even with regard to productivity easily suggests itself. From the national point of view, this question acquires a unique significance, requiring the utmost attention.

In a scheme of profit planning, resource allocation to the different aspects of the enterprise will require the management to integrate the productivity approach into the framework of budgetary control. This

DIAGRAM IV

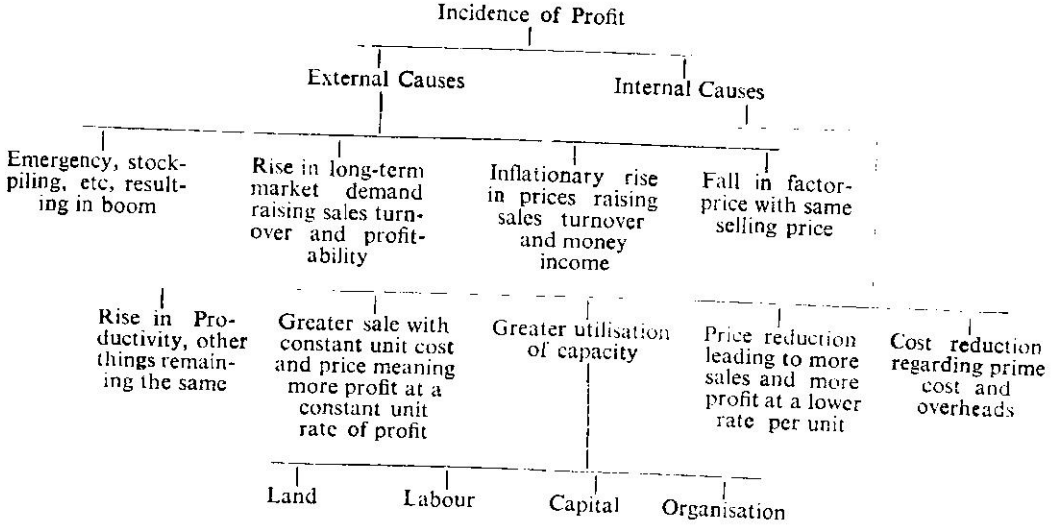
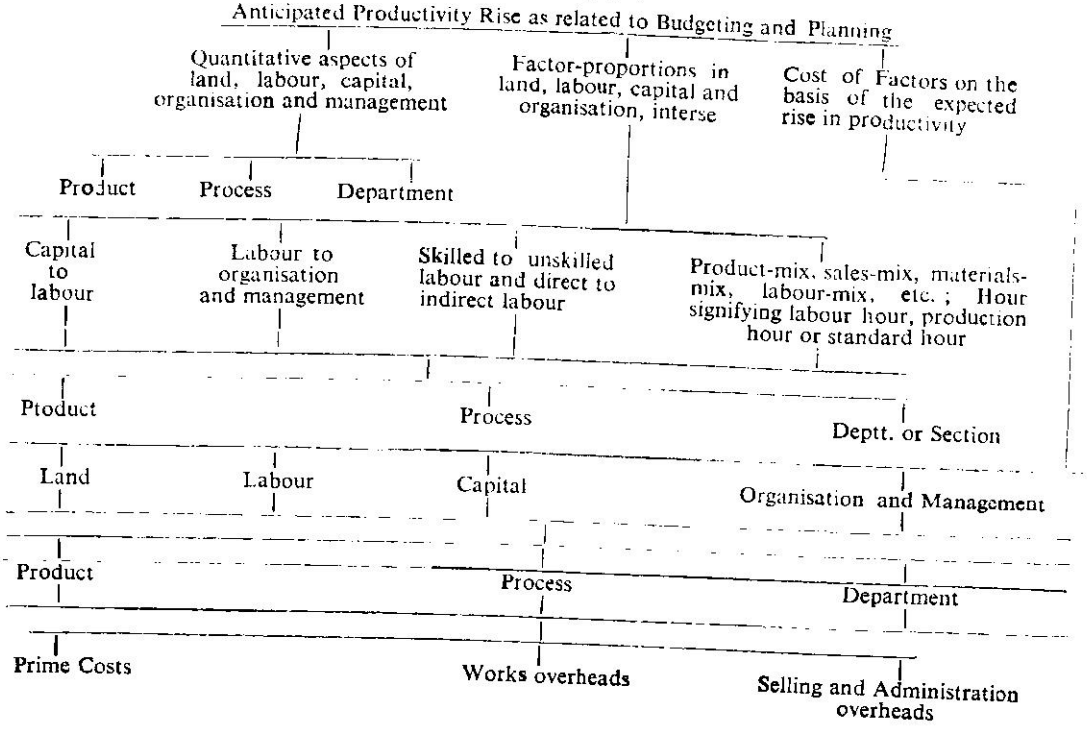


DIAGRAM V



facilitates a realistic allocation particularly because it is based on the expected increases in productivity in different types of resource combinations as borne out either by past experience or by other concerns in the industry.

Diagram V (page 242) shows the different aspects and factors in the budgetary system and their inter-relation. As a matter of fact, the expected rate of return on capital employed, the productivity approach and the budgetary system can all be integrated together to make the budgetary system a better mechanism of overall control and a comprehensive plan of everyday performance. While the question of expected rate of return is tied up with that of pricing of the product that would realise the expected rate, the expected increase in productivity of the different factors will offer a barometer reflecting the changes taking place that would influence the budget targets in physical and value terms.

Thus, measurement of productivity—total as well as factor productivity—however inaccurate such measurement may be conceptually, will offer the management an invaluable method and tool to work with for the purpose of raising the functional efficiency of the concern. At the national level, all countries with planned economic growth as objective have found in this approach an almost unlimited use in utilising their resources with greater effectiveness. At the plant or company level this approach is being increasingly used in the U.S.A., U.K., France, W. Germany and to a limited extent also in this country. There is a tendency to see, apply or appreciate various techniques in isolation. It is necessary to underline the need for an integrated approach for more effectiveness. This approach is necessarily interdisciplinary in character.

Inter-Firm Comparisons*

THE PUBLICATION ON INTER-FIRM COMPARISONS by Dr. Srinivasan, the old boy of NPC, now seized with a fervour to propagate the gospel of productivity, is an additional feather in his cap, for since leaving this organisation, he has published quite a few worthwhile books: Practical Cost Accounting for Textile Mills, Capital Mainteance in Indian Industries, etc. etc.

The Book under review is small but it contains exceedingly rich material. There is little padding and the author shows analytical ability of a high order. The problems and difficulties, advantages and disadvantages of the cotton textile industry in the postwar period have been very lucidly analysed. It is against this background that he has developed his special technique of Inter-firm Comparison as a tool of management in the cotton textile industry. It is rather surprising that MSS has been able to compress within these 65 pages not only the theory of Inter-firm Comparison but also its practical application. These go alongside a mass of statistical tables which, to say the least, are extremely valuable. They would enable anybody, whether he is a textile industrialist or government controller or university economist, to analyse the working of the cotton textile industry from practically any angle, technical or economic, managerical or working class, and yet to have a very clear picture of what is happening overtime; and what is more important, what needs to be done to maximise public welfare, as also private interest. As such, this little research piece would be of unique interest to people working in the textile industry, to people interested in making profit by it and also to people who want to study or control it or make it go forward. Of considerable interest to the researchers frustrated in their attempt to find a common unit of measurement for the widely disparate items that figure in the working of the textile industry is the mathematical formula given on pages 18 and 19. To those of us who were brought up in the study of economics, when there was very little mathematics in it, even this elementary exercise in mathematics would be quite an ordeal. In any case, MSS's incurable desire to befuddle the world with which he happens to deal through a mathematical gadget is enjoyable, interesting and intriguing. The Book is worth reading.

*Inter-Firm Comparison in Textile Industry, An Introductory Study, by Dr MS Srinivasan, published by EMCONS, GPO Box 761, Bombay-1, price Rs. 5.00, pages 65.

Edward Maciel *Tata Fison Industries Ltd.*

Job Evaluation

Experiments have shown that the will to work is conditioned by financial, physiological, psychological and sociological factors. These factors are subject of a good deal of research as it is felt that they play an important part in determining the level of productivity. A human being is a complex creature, conditioned, to a large extent, by his upbringing and the society in which he lives. As such, his behaviour in any situation will depend upon his ego, his likes and dislikes, his frustrations and disappointments, his hopes and fears etc.

SURVEYS HAVE SHOWN THAT LABOUR'S REAL wants or basic needs are:

1. Full employment at remuneration, considered fair by the individual worker
2. A chance to advance
3. Just to be treated like people
4. A feeling of dignity and responsibility
5. A feeling of belonging and of being on the team

Besides these, there are other factors but the most important are those listed above.

There is no single factor in the whole field of labour relations that does more to break down morale, create individual dissatisfaction, encourage absenteeism, increase labour turnover, hamper production, than patently unfair inequalities in the wage rates paid to different individual workers.

William Davis, Chairman of the National War Labour Board, writes: "Nothing, I think, so depresses the morale of a working force as the payment of different wages to men working side by side on the same type of work. Not only does the man, the individual who is getting the lesser wage, want the money—he has a hard time explaining to his wife why he does not get it—but it goes much deeper than that; when a man is discriminated against to that extent, it depresses his self esteem and he begins to wonder, "What is the matter with me ? Why, am I not as good as the fellow next to me ?"

In quite a number of factories we have conditions similar to those that existed in the United States before the war, such as :

1. No Job Descriptions
2. No method of rating jobs, except by overall judgment
3. Salaries determined by guesswork, pressure or favouritism
4. No definite salary ranges
5. No systematic way to get comparative wage data
6. Increases given year after year without regard to importance of jobs
7. Inequities all over the place
8. No definite promotional sequences.

Workmen in general have a fairly good idea regarding the relative worth of their

jobs. They have a high degree of self-esteem. A workman will worry much more about a few paise he gets less than his co-worker than his total take-home pay.

Job Evaluation

It was to correct such situations, take the guess work out of wage scales and produce a sound wage and salary structure that Job Evaluation has been developed. In fact, Job Evaluation is really a blanket term which is commonly applied to the entire process of (i) studying a position to determine the duties and responsibilities assigned to it, skill requirements for successful performance and the working conditions (ii) preparing a job description embodying this information (iii) analysing and evaluating jobs (iv) classifying jobs (v) building up a wage structure.

Job Evaluation does not provide an absolute mathematical value of a job. All that it does is to give the evaluators an organised method of applying judgment to job values. It is not an exact science but rather a tool which can help Management make wiser decisions. Human judgment based on facts exposed by the procedure used is still the most important part of Job Evaluation Programme.

Objectives

The objectives of a Job Evaluation programme are :

1. To establish wage and salary patterns at each location which will attract and hold a high type of personnel to the Company's pay-roll.
2. To establish procedures which will give the employee confidence in the company's intent to be fair and equitable in dealing with salary administration matters.
3. To establish wage and salary procedures which will encourage maximum individual productivity.
4. To establish wage and salary levels which are economically sound for the company.

Methods of Job Evaluation

The methods of evaluating jobs in use are :

1. Ranking method
2. Classification method
3. Point Rating method
4. Factor Comparison method
5. Mobell's system.

Studies carried out into the various systems show intercorrelations among the different systems to be quite high, thus indicating that similar results are obtained even though different systems of Job Evaluation are used. Professor Joseph Tiffin (Professor of Industrial Psychology, Purdue University, Indiana, U.S.A.) states : "Chestler found intercorrelations among the six different company systems to range from 89% to 93%. Two of the systems were factor comparison, two were fifteen factor point systems, one a thirteen factor system and one a combination of ranking and classification system. Using from one to three raters in each plan, raters who were familiar with their respective systems, 35 standard jobs were rated with the six different systems. It was seen that essentially similar job evaluation results are obtained with different job evaluation systems."

There are both practical advantages and disadvantages in every system and any one plan that is installed with ease is almost certain to be better than no plan at all. It is advantageous to use a method that will accomplish the desired result with the minimum of labour, provided the results achieved from a simple system are equivalent to those that would be obtained from a more complex one.

Installation of plan

There are various methods followed for

installing a Job Evaluation System. These are listed below :

1. By Company Employees
2. By Management Consulting firm
3. By Management Consulting firm and employees working together
4. By Management and Labour selecting their own outside representatives respectively who are experts in the field. These experts would normally be assisted by a committee of employees.

Each of the above have their advantages and disadvantages. The last choice, however, appears to be very popular.

The final choice will depend upon the convenience of the company and also the state of Management—Labour relations. Care has also to be taken to see that whoever undertakes the work, has sufficient experience in the field.

To facilitate the installation, Management should make its policy regarding compensation very clear before the evaluation starts. This is necessary because evaluation is sure to result in some disturbance in the job hierarchy.

Instructing the employees on the need of job evaluation and its inherent advantages, as well as allowing employee participation in its installation will facilitate acceptance of the plan.

Advantages

The advantages of Job Evaluation are :

1. In companies where there is no systematic method of determining wage rates, there are likely to be continuous grievances from employees, each worker feeling that he is being unfairly treated.
2. If an employee knows his position in the job hierarchy and the next job to which he can be promoted, he will be better satisfied and will do a better day's work.
3. To provide a definite and sound basis for pay-roll administration in hiring, transferring, promoting, pay increases and lay-offs through the use of standard job specifications.
4. To standardise pay for similar work in different plants and offices of the company with due regard to appropriate area differentials and wage relationships desired with respect to wage levels in the communities.
5. To determine if men now occupying various jobs have the qualifications and are performing the duties and responsibilities required by the specifications.
6. To determine quality and performance necessary for a job when making promotions.
7. To compare periodically wage rates with those for similar occupations at other plants.
8. To bring new jobs into their proper relationship with jobs previously established.
9. To determine if all men are placed to best advantage in jobs available.
10. To improve the allocation of duties and responsibilities in present jobs whenever the process of job analysis discloses the need for adjustment.
11. To increase employees' confidence in the soundness of the company's administration of wage matters and thereby eliminate one of the major causes of employee dissatisfaction.
12. To facilitate prompt and peaceful adjustment of wage issues through having accurate data on wages and job content and values.

Administration

The results of Job Evaluation will have to be maintained properly if it is to continue satisfactorily. This job will have to be done expertly.

The Wage and Salary Administrator has to be alert to see that the Job Evaluation reflects:

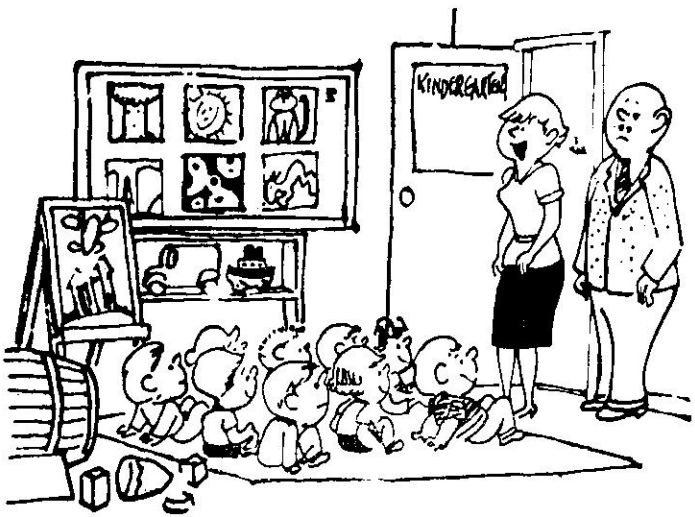
1. Any change which may be made in the Company organisation
2. The establishment of new jobs
3. Any change in job content
4. Changes in general wage levels due to increases in the cost of living and other factors.

At times it may be necessary to deviate from the wage structure in case the market conditions demand it. This usually happens when there is a short supply of certain categories of labour.

Conclusion

The installation of a Job Evaluation System takes a lot of time and requires a good deal of intelligent work. It usually entails extra expenditure by way of compensation.

However, to substitute an orderly system for haphazard wage structure, even though it results in some expenditure, benefits company due to improved morale and productivity.



Now, the Col. will tell you about Operations Recant

A Model Work Study Programme[1]

Bimal Bihari

The term 'model' is derived from the Latin word 'modus' which means 'measure, pattern, or model'. 'Measure' or 'standard' embodies some specified criteria for excellence and sets an ideal or a goal for emulation. 'Pattern' suggests a clear or detailed design of a system. 'Mode' means manner, fashion or style. The term 'model' therefore, means a desired shape or design or set-up worthy of being followed. A 'Model' is, therefore, a simplified representation of essential aspects or properties of an object or a situation. In this sense, the author has worked out a model work study programme for India, as part of a comprehensive study of the Problems of Scientific Management in India, a thesis submitted to and approved by the Institute of Social Sciences at the Hague.

THE MODEL WORK STUDY PROGRAMME FOR India sets out a general code of procedure relating to the introduction of work study in a hypothetical organisation, functioning under typical Indian conditions. The lines suggested here are based on the experiences of the industrialised countries of the west, with modifications to suit Indian conditions. So much depends, however, upon the particular circumstances, in which there are many variables: (a) type and general 'atmosphere' of the industry; (b) consultative machinery already available; (c) the extent of the union organisation; (d) personalities involved (management and employees), etc. It would not, therefore, be possible to lay down in this brief model a comprehensive plan to deal with all eventualities. However, it can be regarded as "point for guidance" to be adapted to suit the particular case and situation. Thus this model indicates more or less a conceptual procedure or design which may be conveniently and usefully introduced with modifications necessary to suit particular needs.

Introducing Work Study

The steps to be taken in introducing work study fall into two stages: first, making everyone aware of management's intentions and creating a favourable climate by educating members of the management and indeed of selected employees and their representatives. The second stage is the actual use of work study techniques in various sections of the organisation. It should be realised that introducing work study is a lengthy process and something like a year may elapse between the first stimulus and the first application.

[1]This is part of an approved thesis on Problems of Scientific Management (Work Study) in India, submitted by the author to the Institute of Social Sciences at the Hague (Netherlands). The reason for its publication in this Journal is a peculiar one. In his frantic search for material, the author somehow reached us; and we rushed to him (at his cost by air) a fairly large volume of literature of which some of our special issues he found particularly useful. Though we did our duty to him as a matter of course, the author went out of his way in mentioning by name the Editor of this Journal, among the acknowledgements made by him in the thesis submitted to the Netherlands University; and he was good enough to send us a copy of his Thesis for publication. For reasons of space, we have taken here one of the best portions among his conclusions.

The Type of Agency to be Employed

Once the management have decided that the application of work study should be made, the next question to be resolved is the type of agency to be employed for implementing the decision. The courses open are: utilising consultancy service, or, establishing a work study department as an integral part of the organisation. Each has its own advantages and disadvantages. In the overall assessment, it would decidedly be more advantageous for large industries to have their own productivity or work study department of a reasonable size. Medium industries could either establish work study on a small scale (a staff of three to six) or go in for Consultancy Service as and when required. Small industries would have to consider the case against their individual background. A common work study department, serving a group of small industries, might be a reasonable solution. This would not preclude them from employing consultants on specific projects.

Communicating the Policy and Creating a Favourable Climate

The first task, after taking a decision to introduce work study in an organisation, is to communicate this policy decision to all concerned and to secure their cooperation and support. It is a prerequisite of success in the use of work study that support be forthcoming from the highest in the organisation. In an industrial organisation this will usually be the board of directors. Once this support is assured, it is likely that the next person to be directly concerned will be the senior official in one locality, say the Works Manager of the factory where work study is proposed to be introduced. It is essential for the success of the scheme that he is emotionally as well as intellectually convinced and determined on action. Lip service is not enough and is unfortunately far too common. This can be achieved by a sound appreciation of the subject sufficient for executive control. To accomplish this, attendance at a well run management appreciation course may be required. It is desirable that the officials should meet others of like status and so realise the basic similarity of their mutual problems. "Change of surroundings and mental environment is beneficial. No amount of reading and informal discussion can imbue the understanding necessary."[2]

Such appreciation courses can be organised by the employers organisations. They can be arranged at important industrial centres like Calcutta, Bombay, Madras, Jamshedpur, Dhanbad etc., to enable small industrial concerns to take the benefit of such courses which they could not arrange individually for themselves.

If the organisation is sufficiently large, they can organise such appreciation courses internally for their personnel alone.

Experience in the west indicates that appreciation courses should be at least of a week's duration: two weeks have proved distinctly desirable, even for the most able. Great care must be taken to ensure that courses are of high standard, and quality.

It should be realised that difficulties arising out of a distorted picture of what work study can achieve are inevitable if the education of the works managers is adequate. Indeed this applies to all members of the middle management who can, directly or indirectly, influence the application of the work study in the enterprise. "It should be remembered always that common sense, even the organised variety described as work study, has always been the hardest subject to teach because all think themselves unusually blessed with this infinitely varying virtue." [3]

The Works Manager should inform the middle management and supervisors, to whatever level is thought appropriate, of the intention to introduce work study, giving them a broad outline and informing them

[2] Currie, R.M., Work Study, p. 31.

[3] Ibid., p. 31.

that they will be receiving further information and training in due course. Much depends on the works manager's handling of the phase, as here he must build up the confidence of the management team and imbue them with a spirit of enthusiasm for work study. In particular, he should emphasise that while there will be changes for improvement, none of these is going to be used as criticism of the existing or past activities of managers. This "no-recrimination" policy is vital to the morale and confidence of middle management and supervision.

Labour leaders and representatives of employees must be taken into confidence regarding this decision of introducing the work study scheme in the undertaking, at the very outset. The objective behind establishing the department and the way in which the workers would benefit by it should be fully explained to the trade union officials. It should be done as early as possible. It has been proved beyond doubt and question that everything is to be gained by so doing; a good deal may indeed be lost by postponing this action. The mechanism might be an informal meeting of local trade union officials called by the works manager or appropriate official, with those of his own staff immediately concerned, in attendance. The desirability of keeping these discussions informal at this stage cannot be overemphasised. It should be made clear that no commitment will be asked for, or given, but that the meeting is a clear and practical demonstration that the Works Manager intends to consult with the trade unions at all stages as further facts are established and progress is made. It should be made clear that dates were not yet known and staff would have to be appointed and trained and it might, therefore, be some months before management could make demonstrable progress.

It goes without saying that the meeting should not be convened until management have a clear picture of the labour problems involved, and have prepared the framework of a policy which will guide their treatment of individual cases. A well-conceived policy must be flexible, bearing in mind that all eventualities cannot be foreseen, but should be far-sighted enough to avoid the danger of embarrassing precedents and "case law" due to inconsistent interpretation. One major point concerns redundancy, and policy on this should be abundantly clear at the outset. It is important that the trade unions be informed on this and other aspects, almost at the same time, as the members of middle management and supervision, so as to prevent the almost inevitable distortions characteristic of an unofficial version of what is intended, spreading throughout the works.

As a preliminary to posting notices throughout the works to tell people of the management's intention to introduce work study, all the departmental workers' representatives likely to be concerned should be given a clear and practical help in order to gain understanding. This can be done, as appropriate, either by works manager at a meeting or meetings, or by providing facilities for the trade union officials to tell their departmental representatives. The growing knowledge of proper work study in the trade unions in Europe is becoming a useful influence in explaining what work study is and allaying inevitable misgivings. India can usefully take a lesson from the experience of the West in this direction.

At this point one thing may be remembered that appreciation talks and lectures on work study and its application, by eminent and knowledgeable persons in the field should also be arranged for the labour leaders and the workers' representatives (trade union leaders, production committee members, and works committee members) and for the work force. Lectures to the work force should be in a language that the people would understand.

In this way the right climate to welcome work study scheme should be created before steps are taken to establish the work study department.

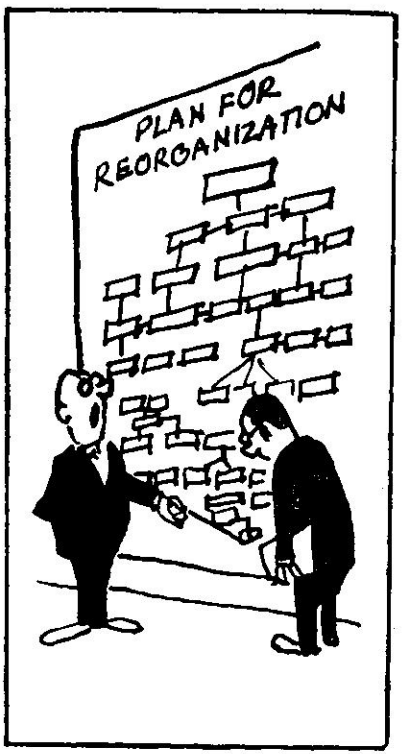
Timing of Announcement

It is vitally important to do all that is possible to build trust and confidence throughout the organisation. This can only come through conviction that work study will bring benefits to all. It is unwise to under-estimate the possible efforts of the ill-intentioned to use such an opportunity for their own ends. Careful timing and demonstrably honest explanation by the works manager in his various announcements can do much to prevent any such efforts to retard well-directed progress.

It is suggested that middle management, supervisors, local trade union officials, departmental workers' representatives and the work-people be all informed on the same day and preferably in the same working period.

This may represent a tight and difficult schedule, but the resultant effect on everyone in the works being told officially is worth a great deal of trouble and its dividend would be considerable.[4]

[4] For reasons of space, we have ended the author's article here, despite the fact that it would give the impression of an unfinished story. Actually, being part of a thesis, quite a lot precedes what has been published here, as also quite a lot follows it. Immediately, for example, we have a whole dissertation on the Organisation of a Work Study Department.—*Editor*



NP RAO

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A Simple Decision-Making Model

In this model an attempt has been made to maximise profit and minimise expenditure by maximising the quantity of production and efficiency of labour. A general flexible model is presented in which any other variables affecting sales and expenditure can be fitted in.

IT IS A TRUISM THAT PROFIT EQUALS SALES minus Cost of production. It follows that, other things remaining the same, minimisation of the cost of production will lead to maximisation of profit. Cost of production in its turn is a function of the quantity of production and the efficiency of labour which happen to be the denominators in the cost function. It follows, therefore, that if these two variables are maximised, the overall cost function minimises, thereby increasing the profit. Of course, it is assumed that the sales are assured and the selling price is constant. The components which affect the quantity of production such as materials, availability of machine hours, etc., are not individually accounted for in the model but collectively presented for making the model simple.

If we take

S = Selling price of one product (constant)

N = Number of products produced per year ($N \neq 0$ or infinite)

E = Efficiency of labour

n_0 = Minimum cost of labour employed even if there is small production

h_0 = Minimum cost of factory overheads

P = Profit per product

L_1 = Cost of material per product

L_2, L_3 = Small constants

L_4 = Cost of administrative staff independent of N

Then

$$PN = SN - \left[L_1 N + \frac{n_0 + L_2 N}{E} + (h_0 + L_3 N) + L_4\right] \quad ...(1)$$

or

$$P = S - \left[L_1 + \frac{n_0}{NE} + \frac{L_2}{E} + \frac{h_0}{N} + L_3 + \frac{L_4}{N}\right] \quad ...(2)$$

From equation (2) it is clear that profit depends only on two variables, viz., N & E. Profit is increased if N and E are increased. It is shown by actual observations that E can be increased to 80%, whereas in general

it is only 50%. Profit is zero if

$$S=L_1+\frac{n_0}{NE}+\frac{L_2}{E}+\frac{h_0}{N}+L_3+\frac{L_4}{N}$$

$$\text{i.e. } N=\frac{n_0+E(h_0+L_4)}{E(S-L_1-L_3)-L_2}=N_0 \text{ (Say)} \quad ...(3)$$

If $N < N_0$ the factory is in loss.

$N > N_0$ the factory is in profit.

So $N > N_0$ essential for running the factory.

In the above treatment we have considered an ideal case which may not be applicable under market conditions. The reason for this is, we have assumed that all the products are sold which are produced by the factory: this, however, may not be true. In fact, selling of products depends upon the demand for them. Let D be the demand in the market. If N is the number of products sold at any time then

$$\tilde{N}=N\bar{e}^{1/D}$$

i.e. $\tilde{N}=N$ if D is infinite.

$\tilde{N}=0$ if D is zero.

All the products are sold if demand is infinite, and no product is sold if demand is zero.

Therefore,

$$P=S\bar{e}^{1/D}-\left[L_1+\frac{n_0}{NE}+\frac{L_2}{E}+\frac{h_0}{N}+L_3+\frac{L_4}{N}\right] \quad ...(4)$$

which is the actual relation for profit.

Taking (4) as profit we can modify equation (3) for N_0 as

$$N_0=\frac{n_0+E(h_0+L_4)}{E(s\bar{e}^{1/D}-L_1-L_3)-L_2} \quad ...(5)$$

Acknowledgement : The author desires to express his gratefulness to his colleagues Sri VP Singh and Sri Harjit Singh for their assistance in the preparation of this model.

A Skit on Industrial Engineering

RD Deshpande*

The Skit, originally prepared by the author for the IPY Souvenir Volume, is based on actual studies, done over the last few years, in a number of Art Silk Mills. The substance of the matter, therefore, is based on real happenings though the dialogue has been woven entirely out of imagination. The author, somewhat illogically, we believe, desires that the findings should also be treated as imaginary, but this would wholly unnecessarily deprive them of the validity that belongs to them on account of their relation to reality .....The characters in the play are the Seth, that is, the Proprietor, who is also the Managing Director of the Mills, Besides, there are the Factory Manager (FM), The Weaving Master (WM), the Processing Superintendent (PS), and the Industrial Engineer (IE). The P.A. to the Managing Director is also introduced as a character. For reasons of space the abbreviations as shown in the brackets have been printed for the characters.

Scene I

(Weaving Master's Office—Weaving Master and Processing Superintendent having tea and light talk when the Factory Manager and the P.A. to the Managing Director drop in—the two Masters stop talking and offer tea to the P.A.)

P. A. Hello you fellows! Having a nice time eh! Well, you know our production has been falling, waste increasing and the Seth has called in the Productivtiy Council's Industrial Engineer. He is already in the office and Seth Saheb has summoned you, W. M. Saheb.

M. W. What is this Industrial Engineer going to do?

P. A. Hang me if I know; but as far as I can understand, he is here to increase our production. He is going to advise us on our many problems.

W. M. Why take this bloke's advice? The remedy for low production is simple. Everybody knows the reasons: weft shortage; all that we want is another pirn winding machine, an automatic one—Murata or Hacoba type, like most Mills. We have too few of them. We have Lessona and Deshi—one is out of order; so there is weft shortage and all the trouble.

P. S. All that this bloke will suggest is to order out immediately some pirn winding machine—even if it be Deshi type—and he will get fat fees for these suggestions. The Seth Saheb will not accept our suggestions, but will pay others for the same. Truly they say *Ghar Ki Murghi Dal Barabar* (one's own chicken is considered no better than pulse).

F. M. Bhai Sahib I do not know what you are talking about, but let us go to the Seth Saheb's cabin where the Productivity Council's Industrial Engineer is already having discussions with him.

*Industrial Engineer, Surat Productivity Council

Scene II

(Seth Saheb's Cabin. The W.M. and F. M. enter and are introduced to the Industrial Engineer who wishes them good morning and expresses pleasure at having met them.)

SETH: Gentlemen, the Industrial Engineer from our Productivity Council has been called here to help us in solving our problems: continuous fall in production, increase in waste etc.

W. M. Sir, I may be pardoned for butting in, but *to my mind there is no need for any consultant.* All that we want is an additional pirn winding machine. Anybody knows that with extra machines or extra men, production can always increase; and why do we want an outsider for giving us advice?

I. E. Mr WM Saheb, I do not deny that additional men and machines will raise production as you say, but I am here to help you to see if we cannot increase output under existing conditions, and I cannot do it without your help and cooperation. In the first instance, let us understand the difference between PRODUCTION and PRODUCTIVITY. I' m sure, you know.

W. M. What ?

I. E. You know what *Productivity* is?

W. M. You mean *Production?*

I. E. Now there's the rub. We can increase production in a manufacturing unit by employing more labour, installing more machinery, and putting in more materials, *regardless of the cost of production.* Production is mere volume of output. Increase of production does not necessarily mean increase of productivity, though higher productivity will lead to higher production, but *at lower cost per unit of output: that's the difference,* Any Works Manager—anybody for the matter of that—can increase output with more machines, more men, more materials; but a competent Works Manager is one who can do it with the same men and the same machines; and I'm sure, you are a very competent Works Manager.

W. M. Of course, and as a departmental head, I am competent to take action; and *I don't need either a certificate or advice.* My dear Sir, it is very easy to talk; when you will be in my shoes you will realise how difficult it is to work and I can assure you that our work is much better than that of our neighbouring mills or of any mills which have sought and taken your advice.

I. E. Sir, I have the greatest respect for your ability but it is possible that owing to your routine work and, possibly, lack of adequate help you are not able to pay all the attention to problems of waste: of waste of materials, of human energy, of equipment etc., etc. It is not your fault. We have all got used to it. You are certainly doing your best; but I'm sure, you are capable of doing it better and I'm here to assist you.

W. M. Well, *I am amused by your talk.* Let me assure you that we have neither surplus machinery nor surplus men. Now I remember, when I was at Bombay I had heard, I think, of some Efficiency Experts, giving some suggestions for retrenching labour. These suggestions could never be put in practice, not only because the union threatened a strike, but possibly because the suggestions might have been unworkable.

I. E. Yes, I know that in the past there has been some misapprehension in this respect because in India, Productivity has been misunderstood as aiming at intensification of labour's burden by increasing workloads but let me assure you that *the Charter of the National Productivity Council is based on the principle that no*

redundancy or retrenchment should result from the application of productivity techniques. Our aim is to utilise the techniques for reduction in consumption of materials, getting more and more out of our equipment etc., by a multipronged attack on waste. You know that generally the material cost is 7-8 times the labour cost. If the labour cost is 8% of the revenue, the cost of materials may be about 60—70%. 10% reduction in labour will mean a saving of less than a paisa in a rupee whereas 10% chopping off in the materials cost, which is usually feasible, may give us about 6 to 7 paise in the rupee. We are, therefore, to obtain higher savings in materials or better utilisation of equipment.

W. M. Well, I have nothing to say if the Seth Saheb wants you to do some work. I can have no objection. Just now, how do you propose to start?

I. E. Well, I will be employing a number of—don't laugh, not more men or machines but—productivity techniques like Work Study, Quality Control, Materials Handling, etc., etc.

W. M. *I do not know what you are talking about* but I must warn you that this is not the time for any interference in our routine as we are already behind in our production target.

SETH. Mr. W.M., this is certainly not the way to talk to a gentleman who is here to help you.

I. E. I appreciate the frankness of the W.M. who, I can see, has many problems. It shall be my endeavour to carry out my work with as little inconvenience and annoyance not only to himself but also to his department.

SETH. At the end of the period you will send me a report, I hope. It should not be merely a paper report but capable of being implemented and leading to savings.

I. E. Sir, all the suggestions will be first discussed with the WM Saheb. As far as possible, no suggestions will be forwarded unless they have been discussed and approved by WM Saheb. Further, as many suggestions as possible will be implemented and you will not have to wait for a final report as I will be submitting periodical reports indicating suggestions already implemented and those to be implemented. A final report will then be submitted and I hope that not only your goodself but your departmental head will be satisfied.

W. M. I hope so.

Scene III

(In about a fortnight the Industrial Engineer carried out Work Study of the Winding Machines and Work Sampling of the Loom Shed, etc., and discussed the findings with WM Saheb).

I.E. Well, WM Saheb, though we have been frequently meeting and you and your staff have been kind enough to give me all the information, I hope I have not unduly troubled you. But today I am afraid I will be taking some of your time.

W.M. Well, what is it?

I. E. You see, I have carried out studies of winding machines.

W. M. Yes, I know you have observed that spindle speeds vary greatly—well that happens in the best of the Mills, but you see the Management is not willing to give me any additional hand to carry out these checks—then what can I do ? This is a fact which I was sensing but could not be definite as I have no time to take all the speeds.

I. E. WM Saheb, I appreciate your difficulties but I was not trying to make out

anything of the variation in speeds—as many of them have already been set right—but I was just trying to confirm your statement that shortage of weft is the greatest single factor responsible for the fall in efficiency.

W. M. This is what I had told you and the Seth Saheb, *but who listens to me?*

I. E. If you will kindly bear with me, I will just show you the results of my studies on winding machines...Let us first take your two Deshi machines ..What happens here? The two machine-men have to go out for empties after doffing and, return with such empties as they can. Now what happens is that since the winder keeps the machine stopped while on his out duty, the actual efficiency of the Deshi machines is not even 40%. I am taking up the question of distributing weft and collection of empties with Management but in the meanwhile can we not arrange that one machine-man stays all the while and minds two machines while the winder is out either for personal needs or for fetching empties.

W.M. I never thought the winders are out for such a long time; I will see if the two machines can be looked after by one winder by mutual arrangement.

I. E. The workload studies show that it is quite possible for the winder to mind two machines. We will recommend incentives not only to this winder but to other winders also.

W.M. What are your findings about other winders? I do not think there is anything wrong there.

I. E. No, only a little adjustment is required. Take your Lessona winding machines...Your allocation is not based strictly on workload: one winder can easily mind 40 or more spindles. I have worked out a standard to show the number of spindles that can be attended to and the production obtainable for 40s staple. The present efficiency obtained is less than 50%!

Count 40s Staple

Lessona Winding Machine

Element.	Frequency/100 Bobbins	Time per operation second	Workload per 100 Bobbins.
(a) Replace Bobbin	100	10.5	1560
(b) Piece breaks	25	9.6	240
(c) Doll & Gait Cone (estimated)	3	1.50	45
(d) Allowance for oiling, cleaning @ 10%	—	—	133
			1468

Therefore workload per bobbin 14.68, say 15

Total time available 450′
Estimated efficiency 75%

Therefore estimated Product $\frac{450\times75\times60}{100\times15}=1350$

This is the normal optimum production per Winder, when not working on incentive. It is assumed that supply packages are supplied at the machine.

The optimum number of spindles is however arrived at as under:

Pirn Building time =6′15″
Max. 7′25″ — Min. 5′30″
Time taken for servicing =0′25″
about 4%

Theoretically, if there were no interference, the Winder could service 25 spindles. However, due to interference the number of spindles that could be alloted would be

25, with loss in production of 6% per spindle due to interference
20, ... 3½%

The ideal number of spindles should also take into account machine utilisation and operator utilisation which is as follows:

No. of spindles	*Approx. Operator and Machine Utilisation*	
	O.U.%	M.U.%
25 ...	85%	85%
20 ...	75%	90%

It would, therefore, be preferable to allocate 20 spindles if the workload is not to exceed 75%. Of course, on incentive it would be possible to allocate more spindles. Efficiency will be much more, as not all the spindles will be unproductive while the winder is away.

Now let us calculate the requirement per loom. Actual studies on looms running this way show that we require about 70 pirns per loom per shift. For 4 looms the requirements would be 280, say 300, needing only 5 spindles whereas in fact, at least 10 spindles on all shifts and sometimes many more in the 3rd shift are being worked.

An excess of supply would mean excess consumption (as the weavers would not care to use to the maximum owing to the exuberant supply position) as well as the possibility of bobbin getting soft due to storage and would also result in less production in winding due to non-availability of empties.

Then there is the question of cleaning the empties. I am taking up with the management the matter of cleaning empties and supply of weft by a team of two workers. In the meanwhile we should take some action to train the winders in the correct way of working; we should also see that adequate attention is paid to Maintenance. You will notice that machines are not oiled properly and are generally in a bad state.

In due course we will also introduce a large package pirn by using 7" pirns and for staple 7½" pirns.

Weavers themselves many times doff pirns (which are not full) or require the winders to doff. This practice should be discouraged. Weavers as a rule should not be allowed to touch the winding machines, nor should they have any influence on the winders.

There are two methods of machine tending in winding, viz., cycle patrolling and random patrolling. In the first method the Winder moves from spindle to spindle, attending to each spindle set as required. This method gives the best results when all the spindles have a constant winding rate.

Especially on the high speed machines, appreciable production is lost owing to certain habits of the Winder:

(1) After a spindle is full, instead of doffing it, the winder waits for all the spindles to get gradually full. Thus many spindles are idle for some time as the Winder starts doffing only when the last spindle is full.

(2) Sometimes, he doffs a whole line of spindles, even if only one spindle is full (sometimes none). It entails loss of output and is resorted to even when there is no urgent demand and when no empties are available. This practice should be discouraged.

Replenishing Supply Package

The present procedure for replenishing exhausted supply package also entails loss in production as it is the practice for the winder to go for a new package—only when the supply package is exhausted. Instances were noted when a particular spindle (or a set) was idle for 5′ at a time, while the Winder was away for fetching the package.

I.E. Well, WM Saheb, what do you think of my suggestions? I am sure that after the

implementation of my suggestions—which you will agree are practicable and will not inconvenience any one—I reckon that at least two winders will be surplus—and these two amongst the trainees would be used for the team, for cleaning and supplying weft.

W.M. I concede that you have brought out many points which somehow or the other have missed my attention—*you know I am so busy* and have no adequate help.

I.E. Yes, W.M. Saheb. I had foreseen your difficulties. That is why we are here to help you on points which you are aware of but just have not the time to go into.

W.M. Thank you but how are you going to put this to the Management. You know the Seth Saheb would only be too eager to find fault with me.

I.E. Leave it to me. I will see that you are not blamed in any way but are praised for active co-operation with me.

W.M. Thank you indeed. I never realised that Industrial Engineering could be so useful. By the way, take up the work in the Weaving Department. You know we must do something to increase the production in Weaving, though I presume that shortages of weft will now disappear...I admit that *instead of wanting more winding machines, we can declare a couple of them surplus.*

I.E. Incidentally, the analysis of returned bottoms should be regularly carried out. This will help you to reduce waste due to weavers not using the pirn to the extent possible and these due to bad winding or bad pirns.

W.M. Certainly. The last analysis was very useful.

Scene IV

(After a few days)

W.M. Well Sir, what are your findings in the loom shed, apart from the increase in efficiency due to proper supply of weft?

I.E. You know, I have not yet completed the studies, but I notice that you have only one shuttle on most of your looms.

W.M. Yes. In cotton line we need two shuttles per loom due to the excessive number of pirn changes. In the Art Silk Industry the changes are few; there is no need for any extra shuttle.

I.E. I agree with your observations regarding cotton looms but you are using 40 staple—with a pirn lasting for 5′ and for 30 D Nylon PLT it is about 12′.

You will appreciate that the non-use of an extra shuttle causes loss of time in shuttling which gives a set back to production. Though theoretically the replenishing of the weft package would only require .2 minutes, in actual practice the time taken is about .55 minutes due to a variety of reasons including interference.

An idea of the loss in efficiency can be had from the following table where the extra time is taken as .5 minutes for replenishing weft for want of additional shuttle.

Quality	No. of Shuttling per Day (about)	Extra Time Required for Replenishing	Estimated Loss in Efficiency
Staple	80	40	8%
30 D Nylon	32	16	3.5%

There are other disadvantages also: whenever the shuttle is in repair the loss of production cannot be avoided. Further there is danger of waste due to discarded bottoms which in many cases could have

been used after slight rectification if an additional shuttle were available.

Provision of an additional shuttle on each loom will also tend to reduce expenditure on shuttles.

W.M. I agree with you, though I confess, I had missed this point. *You know. I am so busy.* But now what about *our Seth Saheb shouting about waste*? I also feel that if I had some time I might locate the wastages but now that we are having your expert advice I think you can better look into it.

I.E. Yes, WM Saheb. I have already told Seth Saheb that due to your preoccupation with other problems it is not possible for you to look deeply into it.

Now at present I would like to draw your attention to only two points. Have you ever noticed extra ends on looms which the weaver has to look after and handle, to prevent damage?

Now look at this statement: the spare ends range from 0-80, the average being about 40. What does this mean? 30 excess ends per loom on 200 looms would mean a waste of one beam of 6000 ends. Most of this is due to warping as I have identified the creel Nos.

W.M. *My God! It is amazing how small but very important things escape us.* It is indeed very kind of you to have brought out this to our notice. By the way, I think there should be some extra ends—how much do you think we should allow?

I.E. Normally, not more than 1 per 1000. But to start with we may allow 2 to 1000 or so, in any case. not more than 10 per loom (average); that is why in assessing the wastage I have taken 30 spare ends out of actual 40. Incidentally, have you had time to look at the Beam Performance Report? You will see that the performances for the same type of beam vary. This again means more supervision on warping.

W.M. Yes, I quite agree.

I.E. Have you noticed the waste on Quality Number...with viscose and acetate beams. You know why this? Well, I have made some investigations in the sizing stretch. During sizing, acetate yarn stretch is about 0.75% while viscose has been elongated to about 4.25%—about 3.5% more than acetate. When weaving with double beams, the acetate will run out first, leaving between 3 & 4% viscose beam waste.

W.M. Thank you indeed. This means that we have to warp different lengths. I am really grateful to you for dispelling my misgivings about Industrial Engineering and I must admit that you have carried out the work without in any way inconveniencing us but on the other hand your work has been of immense help to us. By the way, we would like to employ a junior man, trained by you in Industrial Engineering. Could you recommend any?

I.E. You know, there is a great shortage of men trained in the various techniques of Industrial Engineering or Productivity Techniques, as they are now called. But I will tell you one thing. We are organising programmes for the various disciplines like Work Study, Quality Control, Ergonomics, and I now recommend you to send some of your assistants to these courses.

W.M. Certainly we would. But in the meanwhile can you not train any of our assistants? You had suggested this before but I was silly in not seeing your point. But let bygones be bygones.

I.E. Certainly. You know I would like to train two assistants—one in each shift—in Activity Sampling and Quality Control. Activity Sampling would help you to have figures of efficiency and reasons for the loss in efficiency.

Quality Control will help you to reduce incidence of damage and with this we will couple reed space and grey width

control. There is another thing I would suggest—the regular filling of this Daily Form. I want particularly all the stoppages of repairs, smashes and, above all, Beam Gaiting recorded—Time Beam off, Time Beam on etc., to be noted. You will have some revelations. You feel that Beam change takes about six hours—which is quite normal but you will be surprised to know that it takes about 20 hours.

W.M. No, No, I do not think so. By the way, I have no clerk to fill in forms.

I.E. No, this Form is to be filled in by Supervisors. Since you mention clerk, I am going to suggest provision of a clerk to you for recording Loom Efficiencies, Beam Performances etc. and also to take some control readings.

W.M. However much your work be appreciated and even if convinced of the need of a clerk, I do not think the Seth Saheb will recruit any more clerks.

I.E. No, there would be no need to recruit new clerks; we have to make maximum (effective) use of the available resources. You know, I have studied the clerical work of Checking and Payment Section: a considerable work is unnecessary. There is duplication and I can easily let you have one clerk from this room.

W.M. *I never knew that an Industrial Engineer is concerned with every type of activity.* Do you carry out any work study in Stores also ?

I.E. Yes, certainly. In many Mills we have been able to cut down locked capital, losses due to material not being available in time, by the modern techniques of Inventory Control or rather Materials Management.

W.M. Yes. I know, one of my cousins in a Mill has attended your programme on Materials Management.

I.E. Yes, this course was well appreciated and we had to repeat it within the same month.

In your Department I have noticed that looms are sometimes stopped for long periods for want of items like Pickers, Weft Forks etc. You know what I am suggesting—a locker per jobber to keep essentials. The jobber can on the spot issue the items to the Weaver and next morning recoup his stocks.

This will not only help to reduce but almost eliminate the down time on this account but also render it unnecessary to keep the Stores open for more than one shift by arranging issue days and timings to jobbers.

W.M. I am sure this will succeed. I do not know how to express my grateful thanks to you for bringing home to me the advantages of Productivity Techniques.

Scene V

(The Industrial Engineer, after discussions with Weaving Master, for incorporating all the suggestions in periodical report to Management, and on the day of submission of final report to Management, in the Seth Saheb's cabin.)

SETH SAHEB. Well, W.M. Saheb, what is your opinion about the I.E.'s work?

W.M. Sir, I do not mind admitting—rather I am ashamed to admit—that I was too hasty in speaking unfavourably in the beginning. I am now convinced that Productivity or Industrial Engineering Techniques are of great help and in any organisation, however well managed it may be, wastages and losses are bound to occur and these can best be looked into by these Productivity Specialists. I was thinking my Department is well run—I did not think it worthwhile worrying about what I thought were small points but which,

in fact, were responsible for losses in efficiency, increase in waste and damage. *This I.E. has*, so to say, *opened my eyes about the various areas of waste*—of Men, Machines and Materials and I am indeed happy that this assignment has been of great help to us: Our efficiency has increased by more than 10%.

I.E. By the way, how is the Quality Control and Activity Sampling work going on?

W.M. Splendid. Thanks to your training the assistant. We have now all the data—Quality Control on Looms has helped us to take immediate action to prevent further damage. And we have been able to cut down consumption of yarn by Reed/Space width control, reduction in spare ends, on the lines suggested by you.

I.E. Thank you very much for your compliment. It is pleasing to note that the Productivity Council has been of help to you.

SETH SAHEB. Now I want you to start work in the Processing Department. The Processing Superintendent has readily agreed—perhaps after some discussions with W.M.—to give you all cooperation. And, *by the way, when is the Fuel Efficiency Engineer of the NPC going to visit us*?

W.M. Sir, there is one thing : we should also have a regular follow up by the I.E., for I am now convinced that we will at all times need the help of these Productivity Specialists for helping us to obtain the maximum utilisation of our resources of Men, Machines, Materials, etc. etc.

I.E. I am glad that the W.M. Saheb has become productivity-minded. Thank you, Seth Saheb, and W.M. Saheb. It shall be our privilege to render you any help we can. I shall let you know shortly regarding the programme of NPC's Fuel Efficiency Engineer.

Every Moment, $1\frac{1}{16}$ is Born

When Tennyson published his poem on the VISION OF SIN, the English Mathematician, Mr. Charles Babbage wrote him a letter :

"In your otherwise beautiful poem there is a verse which reads—Every moment dies a man, Every moment one is born. It must be manifest that if this were true, the population of the world would be at a standstill. In truth the rate of birth is slightly in excess of that of death. I would suggest that in the next edition of your poem you have it read—Every moment $1\frac{1}{16}$ is born. Strictly speaking this is not correct, the actual figure is so long that I cannot get it into a line, but I believe the figure $1\frac{1}{16}$ will be sufficiently accurate for poetry".

Courtesy: *Journal of the American Bankers Association*

RK BALJAL

Technical Librarian,
Fertilizer Corporation, Bombay

Engineering Efficiency & Productivity

The word productivity—a synonym of efficiency—is constantly on the lips of politicians, whose minds are exercised by the desperate need for the restoration of Industry after the losses directly and indirectly caused by a disastrous war. The word is, however, often used in a vague and impressionistic manner, without fully realising that improved productivity is a measured quantity and that it is attainable only by the most skilful application of the principle of substitution, supplemented by hard work and even personal sacrifice. It is undeniably difficult for many, whose technical knowledge and training are slender, to understand the quantitative significance of efficiency and of productivity.

THE WORD EFFICIENCY IS DEFINED AS THE ratio of the "return" to the "outlay" or the ratio of the "output" to the "input". The attainment of high efficiency or productivity is the ideal goal of every engineer who has to select the best machine or appliance for a specified performance or to determine the best speed, load and operating conditions for an existing machine. The correct choice among possible alternatives depends upon an intelligent review of efficiency calculations and tests.

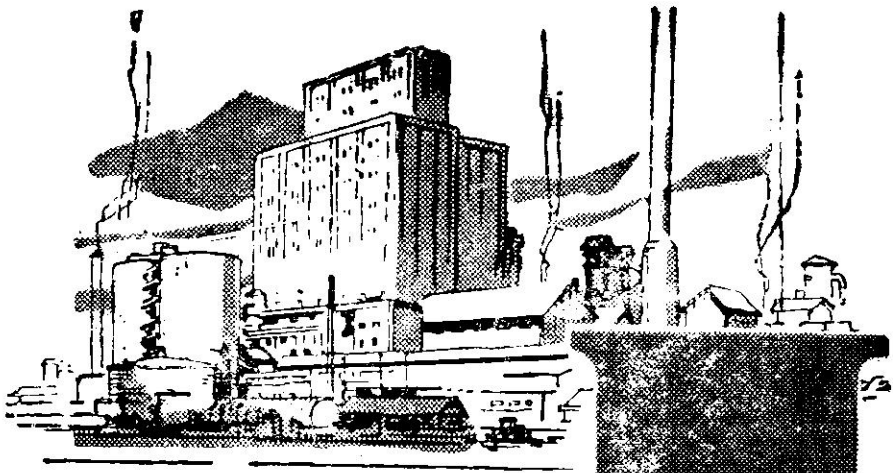
The design of a turbine, for instance, for fully utilising a supply of water under a fixed head offers a typical example. Theory and experiment both show that, at a particular steady speed, a correctly designed turbine will deliver at the main shaft more of the available energy per gallon of water than at any other speed, and its productivity, or efficiency as a power generator is then at its maximum.

The engineer has immense flexibility in what might be called the morphological character of his designs, before deciding on their constructive details. It is almost invariably true, however, that the centrifugation and construction must follow the lines of a master model, due to some pioneer who produced it as the concrete embodiment of a new concept. Many of the brilliant innovations that promote engineering efficiency, possess only qualitative merits in their early stages. Their advent is unpredictable, for they may originate either from some happy inspiration or from that patient reflection on existing knowledge and conditions that may successfully indicate a new direction of progress: a new mechanism or device gets evolved, leading to the foundation of a new industry or the economic transformation of an existing industry. Its real superiority can, however, only be proved when the quantitative factors of efficiency have been checked by the professional engineer.

Many types of engineering construction include two distinct elements, which can be

combined in such a way that an increase in one permits a decrease in the other or *vice versa*. Under these conditions it is generally possible to combine them in definite proportions, which give a minimum capital outlay and the lowest running cost. Such a case occurs in electrical disribution net-works, comprising feeders and distributors : although copper conductors are used for both, their respective dimensions are derived from considerations which virtually treat them as if they were composed of different materials. The drop in a feeder may be made much greater than in a distributor, where it is restricted by the permissible pressure variation at any point of supply along its length.

The problem of the disposition of materials to ensure the greatest economic advantages appears in many forms. In the well-known hydraulic problem, when a given volume of water has to be conveyed in rectangular channel of concrete or iron, the loss of head caused by fluid frictional resistance is proportional to $x + 2y$ where y is the depth and x is the width. As the area xy, proportional to the volume, is fixed, the value of $x + 2y$ is a minimum when $x=2y$ and this is the criterion for the best proportions of the channel, or those that involve a minimum of material for a given loss of head and volume of water delivered. Again, in the design of cantilevers and girders the best distribution of the material is at once fixed (when the variations in the valve of the bending moment are known) by the formula $M=fz$, where M is the bending moment at any point, f is the greatest permissible stress in the material and z is the modulus of the transverse section. Thus, for a cantilever of uniform width in plan, loaded at its end, the elevation is a semi-parabola, with its vertex at the load.



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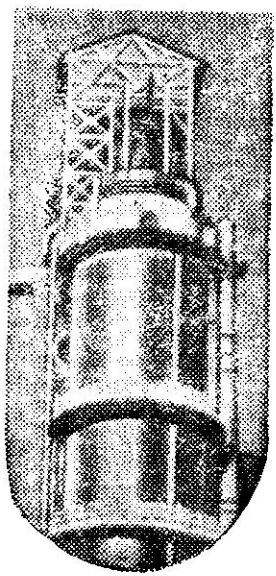

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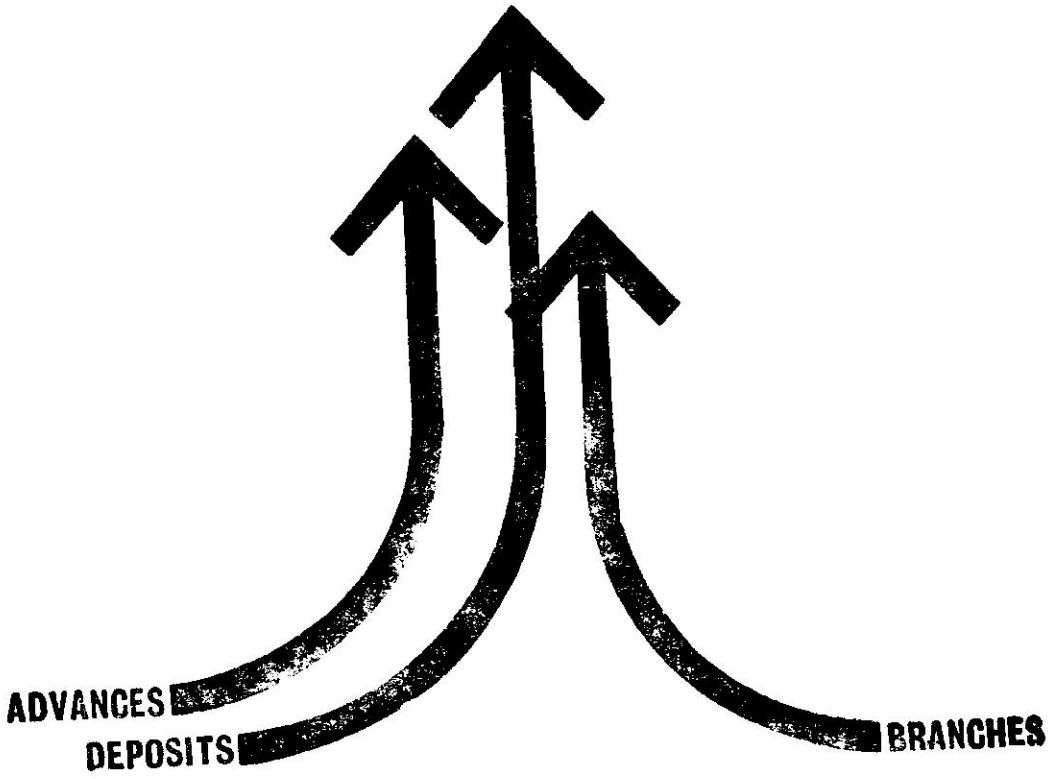

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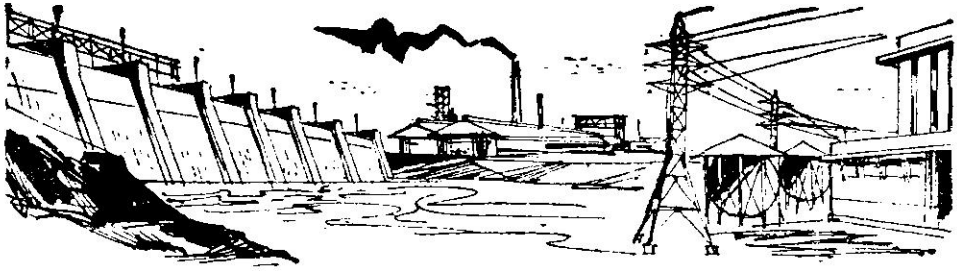

The Changing Face of India

The face of India is changing and the change is being brought about by economic progress promoted through the Five Year Plans.

Steel was the core of the Second Five Year Plan; three new million-tonne steel plants came into being on greenfield sites at Durgapur, Rourkela and Bhilai. With 3 million tonnes of steel from these plants under public ownership and 3 million tonnes from old established steelworks of the private sector, Indian steel output has risen from 1.5 million tonnes to 6 million tonnes.

The achievement, which highlights India's rate of steel expansion that has few parallels in the world, is as much a tribute to India's determination to industrialise as it is to international goodwill towards India's aspirations. Rourkela was built with the help of West Germany, Bhilai with that of the U.S.S.R. and Durgapur with British collaboration.

Hindustan Steel Limited, the company which owns these steel plants has its own iron ore mines, limestone and dolomite quarries. To conserve India's limited resources of metallurgical coal, HSL has built four coal washeries with a potential to wash 10 million tonnes of coal annually. Now an Alloy Steels Plant with an initial capacity of 100,000 tonnes is added to an unrivalled record of construction on this part of the globe.

Pioneers in India in introducing the basic oxygen process and new flat products, slag granulation and sintering, HSL looks forward to keeping pace with the newest techniques, such as, continuous casting and vacuum degassing. Fuel injections and high top pressure in the blast furnace operation have already been introduced effectively.

Hindustan Steel's Engineering and Design Bureau took full responsibility for the Third Plan expansion of Durgapur and Rourkela and the Project Report for the Fourth Plan expansion of Durgapur has already been submitted. Excepting a few foreign specialists the plants are almost entirely run by Indian technicians—a striking success of the Company's sustained and large scale training programme.

The capacity of these three steel plants is being doubled to 6 million tonnes and preliminaries for the expansion in the Fourth Five Year Plan to 9 million tonnes—out of the 16 million tonnes national target—are being completed.

Hindustan Steel must grow fast, faster than any, to bring the country nearer to self-sufficiency in steel.

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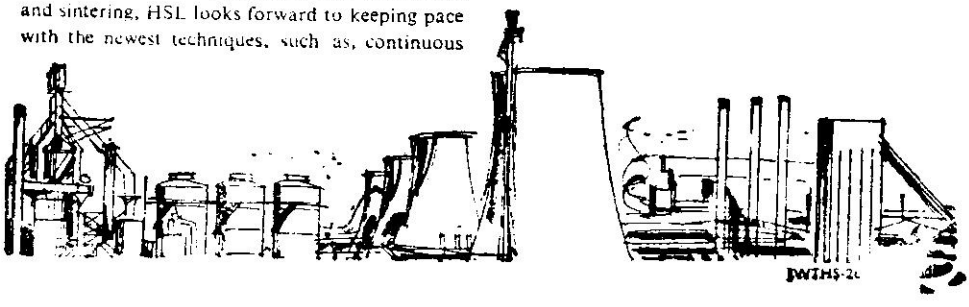
Works : Rourkela, Bhilai, Durgapur.



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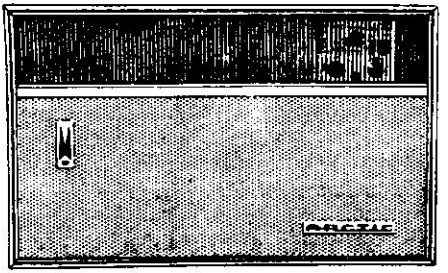

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Cost Reduction for Export-Oriented Industries[1]

PY Thatte[2]

THE DRAFT OUTLINE OF THE FOURTH FIVE YEAR PLAN, recently published by the Planning Commission, mentions, among other things, that the principal increases in exports[3] are expected in respect of tea, iron ore, engineering goods, jute manufactures, fruits and vegetables, vegetable oils, oil cakes, unmanufactured tobacco, cotton fabrics, iron & steel, chemicals and allied products; smaller increases are also expected in the export of sugar, coffee, spices, coir yarn and manufactures and handicrafts. The planners have thus earmarked for export a substantial number of items of industrial output. Indirectly, it marks out what may be called Export-Oriented Industries.

In practical terms the implication is that the whole of our present-day industrial complex is or ought to be conscripted, or geared up for exports, as it now constitutes the life blood of the economy of all nations, big or small, developed or developing. In this context the terms, 'developed' and 'developing' are used relatively, for no nation is so fully developed as to need no further development. Each developed nation is also a developing nation in its own sense, needing more and more exports for the sustenance of its economy and for escalating the already higher standard of living of its people.

This being so, it should become abundantly clear how great and urgent the need of an industrially nascent country, like ours, is, in respect of exports. No wonder then that the target of Rs. 8030 crores or an increase of over 50 per cent during the Fourth Plan period has been fixed by our planners. Such a substantial boost to our export trade would not be an easy task, but the dependence on foreign aid to the extent of Rs. 4340 crores is obviously excessive; and the chances of obtaining it without strings appear to be getting remoter day by day. To cite an example, take the case of non-project loans. Out of our total Fourth Plan requirements of 900 million dollars of non-project loans we have received firm commitments of only a little over 500 million dollars. Under the circumstances an all out effort to give a sizeable boost to our exports becomes a compelling necessity.

In this vast ocean of world's export market, however, the sailing is not at all going to be any smooth. It is one thing to operate within the protected sphere of one's own home market and quite another to emerge in the export market of the world where both developing and developed nations meet in open competition with a view to keeping the other countries out. In this bid the developing nations will have to be wary about the moves of the developed

1. This essay has, for its general background, the author's article, "PRODUCTIVITY & COST REDUCTION", published in the Autumn '66 issue of the *Productivity* Journal, wherein various methods of cost reduction were analysed. To get a full view of the author's ideas on the subject of Cost Reduction for Export-Oriented Industries it would be advisable to read the two papers together.
2. Accounts Officer, TELCO, Jamshedpur
3. *Yojana*, September 4, 1966—p.22

nations, who, by virtue of their superior economic and political strength, combined with their higher technical skills and advances in technology, can manoeuvre to shut up the doors of some of the world's export markets to the goods of the developing nations. And in this process there would be instances of one developing nation raising tariff walls against another to save its infant industries from crippling competition. We shall thus have to make an all out effort to win export markets. India's share or gain therein will work out to be directly proportionate to the combined efforts of our people, who for the purposes of this paper have been classified as belonging to the following four broad categories:

i) The Government
ii) The Industrialists
iii) The Labour, and
iv) The Consumers

People's Role in Export Promotion

What should the people do to make our industrial output 'exportable'? This would cover all possible strategies, but to all intents and purposes, it boils down to cost reduction methods. We have analysed below how the mass of consumers may use these strategies or cost reduction methods in the interests of directed exports promotion. As consumers, we must, in the first instance, realise that a certain amount of inflation is bound to be generated in the economy of all developing nations; so if the consumers do not exercise a judicious restraint on their buying, they would by their action divert the flow of such goods as are meant for export back to the home market. Abstinence or self denial should, therefore, be the strategy that must be employed by all the consumers. It will pave the way for equitable distribution of the goods available for internal consumption and also act as a self-regulating check or lever on the spiralling of prices. Under such self imposed restrictions on demand, the suppliers would be compelled to produce the goods for sale in the foreign markets at the most competitive prices. This strategy as a method of cost reduction, however, succeeds only when the consuming masses have received the neccessary education regarding the 'how' and 'when' of their purchases.

The working class, including clerical staff, occupies an important position in the social economy. Labour has control on matters directly connected with it or coming within the radius of its influence. Unfortunately because of the illiteracy of most of the workers they are being torn between intergroup and inter-union rivalries: on account of political motives, workers have not been allowed to develop a healthy spirit of identifying themselves with the industry. A sense of aloofness (as opposed to the sense of belonging) has developed in the minds of the workers, the apparent symptoms of which are found in unauthorised absenteeism, heavy incidence of labour turnover, etc. All the same it is a matter of pride that *an average Indian worker is in no way inferior to his counterpart abroad.* Therefore by imparting the necessary education the workers can be made conscious of their responsibilities in this regard. They are to be told which their spheres of influence are and what they can do to make the goods which they produce exportable.

In this connection, it may be said that the cost of a holiday or a nation-wide strike, *bandh*[4], etc. has perhaps never been worked out in our country. When the question of granting an extra national holiday came up for discussion recently in Austria, it was pointed out that a nation suffering from economic stagnation and reduced productivity could hardly afford the cost of a holiday amounting to 20 to 30 million dollars. They, therefore, decided to exchange one of the religious holidays for the National Day. This example of Austria, if narrated to our workers, would definitely have the desired effect. Similarly an awareness in respect of the damage which stoppages of work cause to

4. Complete closure

our country's economy can be created among them.

In the present economic plight of our country the fashioning of an independent incomes policy, or one similar to that followed in Great Britain, has become an urgent necessity. Under this our workers, if they are made to understand the gravity of the situation, would not be unresponsive to the call of a wage freeze[5]. Yet such voluntary wage freeze agreements, though welcome in their own way from the point of view of holding the price line, have a temporary effect. As a permanent solution the linking up of wages with the productivity index of labour appears desirable: if agreed to in principle by all concerned, this would, in addition, provide the most equitable basis for wage fixation. This will have a tremendous impact on the overall unit cost of production and particularly on that part of it which is attributable to labour.

In this connection, it is important to realise that the incidence of wages on the cost of production depends essentially on the efficiency with which labour works. This is completely within the influence of the workers, and they can make the incidence of their wages felt high or low in the total cost of production. The material cost of any industrial output, though amounting to nearly 60%, ordinarily offers very little scope for reduction; therefore we have to cash in on our advantages in respect of the cheapness of labour and its skill, backed by efficiency and necessary training. The example of the Japanese is worth emulating in this regard. Although in certain respects like availability of raw materials, etc. they are in a disadvantageous position, they have carved out for their products a distinct place in the export market. What could be achieved by the Japanese partly through hard work and cheap labour, but mainly by dint of their efficiency and high sense of devotion to duty, could as well be achieved by us if stimulated to break the record of foreign workers. And the time for us to get so stimulated to make our entry effectively felt in the world markets is now or never. With this we turn our attention to the third category of people, the industrialists.

They are the people at the helm of affairs in their respective industries: in their decision-making tasks they are guided by experts at departmental levels. The export market is a buyer's market; it is only through cost reduction that we can have an edge over others to maintain our position. Thus the Cost Accountant comes into his own. Acting on the advice of his experts but relying mainly on the timely reports which the Cost Accountant brings out as to where the cost is going up or is already comparatively higher, various cost reduction measures may be introduced by the industrialist. Some such measures which the industrialist can introduce singly or in concert with others in the line are described below:

A. LABOUR

(i) *Methods Study:* By this study it may, at times, be possible to eliminate a part of a job which makes no useful contribution to the final product and thus reduce cost.

(ii) *Job Evaluation:* Disputes arising out of improper fixation of wage rates sometimes lead to cost inflation. For resolving these disputes, job evaluation may be undertaken. It systematises fixation of wage rates for different jobs by comparing one job with the other and thus helps in setting proper wage differentials.

(iii) *Ergonomics:* Indians judged by the height, weight and other physical or health standards of Western countries compare unfavourably and as such proper ergonomic

5. There is little evidence that organised labour would be agreeable either to a wage freeze or a productivity-linked wage level. In the UK wage freeze is part of a general freeze of incomes and prices; and Government encourages Productivity Agreements between Management and Labour.—**Editor**

studies for finding out, for instance, the least fatiguing position for a worker to operate a machine to attain a desired level of production, may have to be taken up as a possible source for cost reduction[6].

(iv) *Utilisation of Available Capacity:* While the approach of countries having labour shortage would be towards automation, that of ours should be on more intensive utilisation of our labour force and of the installed capacity to increase the volume of production to bring down cost per unit.

B. PRODUCT

(i) *Market Research:* Before embarking on any project either for the manufacture of an entirely new product or one already in vogue, systematic market research is necessary. Under this all the data would be subjected to statistical analysis so that proper estimates of the potential demand for the product and the areas from which it is likely to come can be made. At present, considerable costs are incurred, in the absence of adequate market research, as a result of errors arising out of wrong decisions regarding quality of product and scale of output. Market research will, therefore, lead to considerable savings in the cost of production.

(ii) *Value Engineering:* This is useful in respect of a product already in vogue. By carefully analysing what each component of the product is for, why it is of that shape, why made of that material, etc., it is often possible to simplify the product, reduce its cost and improve its appearance. The example of match box manufacture is worth noting in this respect. The match stick striking surfaces have been halved, thus bringing about a considerable saving in cost, without any adverse effect on appearance.

(iii) *Design:* Asking actual and/or potential customers questions about the product, as to how and when they use it and what difficulties they have with it, may bring to light the defects in the design of the product.

(iv) *Product Mix:* Complex problems occur when several products (each with different profitability) made from many components (each with different costs) are made on different machines (each of different capacities) as to which mix of products made from what selection of components and on which machines would give maximum profit. For determining the best product mix from the cost angle, linear programming and other mathematical techniques are usually employed.

C. PRODUCTION PLANNING

For ensuring continuous production, free from bottlenecks and other interruptions due to the complexity and multiplicity of processes involved, other mathematical techniques like PERT, Critical Path Method, Simulation, etc., come in handy for production planning so as to evolve the best and cheapest method of production. The trial-and-error methods may prove abortive and costly in the long run.

In this context, the industrialists should see that production planning is export-oriented, giving top priority to production for foreign markets.

D. COSTING

In industries in which goods are produced simultaneously for the home market as well as for export, a two-way costing system can be adopted. That means that prices of

6. This is rather stretching a point too far. Ergonomic studies are certainly desirable and essential, but investment in ergonomic studies and in the facilities recommended by such studies would increase costs. It is only indirectly and over a long period that ergonomic studies may lead to cost reduction. In any case, that is not their essential purpose. The idea behind ergonomics is to condition and reorganise machines and machine situations so as to fit established physical characteristics of human beings in a given environment : cost reduction would only be an incidental advantage.—**Editor**

goods for domestic consumption will cover direct variable production expenses, and also *absorb in full* the total fixed overhead expenses of the firm; the price of export goods will be based mainly on variable costs. This system known as Direct or Marginal costing allows the idle capacity of the industry to be used so as to bring down cost of production of goods in the industry in general.

E. MARKETING

The technique of contribution analysis may be used with advantage in the field of marketing. This analysis shows by how much profit (as opposed to cost) is affected by changing sales volume or product mix. Particular attention is paid to the contribution to overhead costs, brought about by these alterations.

In this connection, profit-volume ratios and break-even charts, showing at what level of sales the contribution equals the fixed overheads, can be prepared to give out useful information.

While dealing with sales, the industries manufacturing goods with foreign collaboration would do well to get the world's export market clearly demarcated for their products and ours.

F. FINANCE

All this requires money which can come in the manner desired and at the right time only through financial planning, including a continuous watch on the ways and means position. Specifically for evaluating capital expenditure proposals, our industrialists are getting familiar with the use of modern techniques like Discounted Cash Flow and Net Present Value. Briefly, under the DCF method (which is more scientific), the cost of capital investment in a project, that is, cash outflow, is measured against the present value of the resulting year-by-year cash inflow from the project.

G. PLANT & MACHINERY

At this stage of our country's industrialisation it would, perhaps, be prudent to go in for the conventional type of machines and tools rather than the highly sophisticated turn key plants: the latter are in fact designed for countries where there is shortage of labour. They are not only costlier but are liable to become obsolete any time: they would have no resale value nor could they be put to alternate use. In addition their maintenance is difficult, and spare parts are hard to come by.

In view of the above, the skilful use of our cheap labour and conventional machinery might put us in a better competitive position in the world market[7]. However, the economics of both types of plant will have to be worked out very carefully before ordering new plant. It cannot, however, be denied that some of our old established industries like the textiles stand in urgent need of modernisation.

H. SELF-RELIANCE

In order to free India from dependence on imports of essential raw materials and components, systematic attempts to produce them indigenously will have to be made. Each industrialist should prepare periodically a statement of the various foreign components going into his product and take steps to produce them himself or get them produced within the country. This will also enable him to calculate the *swadeshi* percentage of his products.

I. THE COMPUTER CENTRE SYSTEM

While we may use conventional machinery, we shall certainly have to modernise our economic system, if we are to make the best of our export markets. To attack the complex problems of product sale mix,

7. In total production, the Japanese economy is now comparable to that of advanced West European countries. And she achieved this with a greater labour force and with a little less capital equipment than other advanced countries (*Fortune*, August 1966, page 42)

economic batch quantities for manufacture, purchase and sale with the aid of mathematical techniques, we must resort to the computer for these calculations and also for costing, stores accounting, preparation of pay-rolls, etc. The installation of a computer being not within the means of individual industrialists, a centralised computer service may be cooperatively organised for each centre. Under this, the cost would be shared by all the users in proportion to the time of utilisation.

J. INTER-FIRM COMPARISON

Inter-firm comparison is a potent technique for cost reduction. The federation of each industry would be well advised to establish a centre for inter-firm comparison, to get and process factual data on costs to enable manufacturers to know how their costs compare with others. Since our objective is export promotion, it would be preferable to have similar break-up of cost information regarding manufacturers abroad. It is heartening to note, in this connection, that a centre for inter-firm comparison, jointly sponsored by the Ahmedabad Management Association and the Ahmedabad Textile Industry's Research Association, has recently been set up at Ahmedabad.

K. RESEARCH & DEVELOPMENT

Owing to the devaluation of our currency the cost of imported raw materials has shot up by 57.5%. This is why research for import substitution has to be carried out on a war footing, (without of course making too much of a fetish of the whole thing) equal stress being laid on the development of the known indigenous sources of raw materials. Such a project, requiring large capital outlay, has to be financed jointly by all the industrialists, for obtaining quick results.

L. SALES PROMOTION

Instead of each industrialist making his own arrangements for the promotion of the sales of his products in foreign markets, it would be economical and meaningful to organise such programmes in a big way by pooling their resources. It would thus be possible to notify effectively potential consumers the presence of our products in the export markets. For this purpose all known media of advertisement like television shows, fashion parades, participation in trade and industrial exhibitions etc., may be used. At the same time, some new thoughts have to be given to the packaging of our products. It should not only be protective but also economical and attractive. Any reasonable amount spent on this score would bring in handsome dividends.

M. FAIR TRADE PRACTICES

Indian exporters have already earned a bad name in the world market. As such, industrialists would do well to set up jointly their own inspecting and vigilance machinery to ensure that members employ fair trade practices. Perhaps warranties with 'money back' conditions will have to be issued and scrupulously honoured in order to retrieve confidence of foreign buyers. With this we turn to the last category of people who form the Government.

N. THE GOVERNMENT

By the Government we mean those ministers of the Central Cabinet who look after the portfolios of finance, commerce, industry and planning. They have a very positive role to play in this matter.

(i) *Undelayed Announcement of Policy Decisions:* The first and foremost step would be to spell out immediately, clearly and unmistakably what the policy decisions of the Government of India are in regard to the promotion of exports. It is not good enough to exhort the industrialists to export more so as to bring in the much-needed foreign exchange. While there is no doubt that devaluation was a step in this direction, it does not end there. More positive conditions, favourable for exports, have to be created and given widest publicity.

(ii) *Export Incentives:* While it is theoretically true that devaluation by itself

should afford the necessary incentive to export more (leaving no justification for continuing subsidies and tax rebates to exporters as in the past), it may be necessary in individual cases to continue these concessions, or at least not to make frequent changes therein. It would be in the general interest, if Government comes out with a clear declaration about export subsidies.

(iii) *Price Control:* If the wage freeze policy advocated for adoption by our labour has to succeed it must be accompanied by a strict price freeze policy which our Government must adopt as a creed. Since our country has to get an economic rebirth consequent on devaluation, economic discipline is a *must* to contain inflation. For this, wage freeze and price control will have to go hand in hand, much of which necessarily depends on governmental efforts. As such, Government must initiate measures which will ensure proper price control.

(iv) *Import of Essential Raw Materials, Components, and Maintenance Spares:* To achieve the above objective of price control and at the same time give the necessary help to our export-oriented industries, Government has to see that the wheels of our industries do not come to a standstill for want of essential raw materials and components. Addressing the concluding session of the Export-Import Advisory Council, Sri Manubhai Shah, then Minister for Commerce, had suggested that raw materials be supplied to export industries at international prices and that a network of raw material depots would be set up in all important cities to facilitate the easy availability of supplies to ensure that export effort is not handicapped. As a part implementation of this important policy statement, Rs. 3-crore allotment has already been given to the State Trading Corporation. It is proposed to establish a Directorate of Export Production, and there will be a Rs. 50-crore revolving fund for importing capital goods. While dealing with this aspect, it may perhaps prove economical to buy scarce raw materials from underdeveloped countries, rather than from other developing or developed countries, and arrange for their processing in our homeland.

(v) *Export Target:* In consultation with the various Federations of Industries and Commerce, Government and the Planning Commission should fix export targets for each industry with the share of each individual manufacturer determined according to his installed capacity. In doing so it should be assured that those industrialists who fulfill their export obligations as set out would become automatically eligible for their import entitlements without let or hindrance.

(vi) Whilst the general rule should be to exercise restraint in sanctioning new capacities unless the installed capacity is fully utilised, licensing of new projects having an export bias should not be delayed. The possibility of setting up units in foreign countries for assembly of our products, like the one for railway wagons in Yugoslavia, need proper exploration from the point of view of giving our products edge over others. In any case, uncommitted foreign aids or loans, as and when they become available, should, as a matter of principle, be first applied to financing the expansion schemes of the industries which are engaged in the production of goods for export. This would positively act as an additional incentive.

(vii) *Fixing Prices for Exports:* Government should open a cell for cost studies for each industry. It should function under the direction of the Tariff Commission. On the basis of cost data of Indian industries and their counter-parts abroad, the Tariff Commission should fix the selling prices of our export goods. This should prove equitable and set in motion a competitive spirit among our industries.

(viii) *Quality Inspection:* The Indian Standards Institution should lay down the same standards as are specified by the manufacturers overseas. If our standards or specifications are over-rigid or too loose, it would affect our competitiveness. In this

respect it is good news that 80% of our export goods have already been brought under quality control and pre-shipment inspection. Measures to cover the rest of the items should, therefore, be taken as early as possible.

(ix) *Advisory Service:* In the UK, the Board of Trade renders valuable service to exporters. Similarly, in India the Export-Import Advisory Council could, in close co-operation with the Indian Institute of Foreign Trade (New Delhi), provide exporters a wide range of advisory services in regard to known and unknown markets of the world. This task would become somewhat lighter if the help of our embassies abroad is enlisted.

(x) *Export Credit & Shipping Facilities:* The activities of the Export Credit and Guarantee Corporation, which the Government of India has set up for covering export risks and supplying information about overseas buyers and for providing guarantees to banks for pre-shipment and post-shipment finance, are not yet as widely known as desired. Besides this, it will have to make its rules less irksome to the exporters.

The Shipping Corporation of India, a Government of India undertaking, has also to come out with concessional shipping freights for our exports[8]. The Japanese export drive shows what role shipping can play in operation "Exports". It can make or mar the prospects of our goods showing themselves up in the foreign markets.

(xi) *Labour Laws:* The stoppages of work since last year have adversely affected industrial production. Perhaps time has now come for the Government to re-define 'strike', as its present definition is inadequate in the context of the current situation. The new definition should include all forms of cessation of work such as 'go-slow' and 'work to rule' practices[9] followed on a large scale. These tactics have made a mockery of the Essential Services Act and undermined industrial discipline throughout the country. All industries which are engaged in the production of goods for export should also be declared as essential as the ordance factories engaged in production of defence equipment and brought under the purview of the Defence of India Act.

(xii) In spite of all the help which the governmental agencies can render it will have to be accepted that our exporters (who are shrewd businessmen) will have to make their own arrangements, to explore avenues to usher our products into the world's markets. This needs to be looked into, for without aggressive salesmanship, our goods will not sell in the highly competitive markets abroad.

(xiii) *Tax Structure:* If we are to do our best in the export markets, the tax structure itself will have to be export-oriented. The *Saraiya* Committee examined how to free exports from sales tax at different points in an export transaction. The introduction of the Value Added Tax System in our country on an experimental basis within the Indian corporate tax structure is being talked about. The value added tax has been in operation in France for over a decade. It is a multipoint turnover tax imposed at each stage of production and distribution on the sales of business firms minus costs incurred in the purchase of goods and services from other firms. Since under this system, only the net value added at each stage is taxed, it gives effective spurt to companies to maximise their productivity, and their investments. The Finance Ministry of the Government of India would, therefore, do well to consider the proposition of introducing it in our country.

Through the adoption of methods discussed above, it may be possible to *make our products exportable.* If all of us play our assigned roles truthfully and honestly and with determination, there is no reason why we cannot be successful in our export drive.●

8. This will necessarily be limited by international agreements and customs—**Editor**
9. How about the *Gherao*?—**Editor**

Organise Your Cost Reduction Programme

Jitendra Kumar Singhi*

THERE IS NO DEARTH OF MINDS WITH creative ideas but these remain unexpressed due to lack of suitable motivation and direction. Many potential sources of ideas remain unexploited due to want of channels through which they can flow. A properly planned scheme, to use these ideas for reducing operational cost, would be of immense utility to any organisation. The aim of an organised CRP (Cost Reduction Programme) is to provide this motivation and direction, to establish a system to tap resulting ideas and to construct a receptive organ to evaluate and utilise them for the benefit of the organisation. The essential features of any CRP are :

1. To motivate people to be cost consc - ous
2. To orient their minds to think analytically
3. To provide a channel of communication for flow of ideas
4. To evaluate ideas for their economic benefits and practicability, and to take decision
5. To instal accepted suggestions
6. To review their progress

An organised CRP must evoke interest and enthusiasm of every individual in the organisation. All employees must feel themselves as participants of the Programme. In this connection it is necessary to give wide publicity to the programme among the employees through posters, display boards, and to call them in groups with a view to talk to them the need for cost reduction, to ask for their help and contribution. They should be encouraged to express their views freely. It is essential to find out the mental hurdles which might prevent them from taking active interest in CRP. All this should be done, at least in the beginning by the highest executive of the company, in a very informal way. This would help in boosting the morale of the employees and gaining their confidence.

In this connection, every one would be well advised to check with the local NPC or LPC office if they are going to arrange any training programme in Method Study or Cost Reduction. If not, they should be requested to arrange one. Employers should make it a point to train a few of their employees in these fields. They should be on the look out for experts on various Cost Reduction Techniques visiting their city. If they find any, he should be invited to give a talk to the employees on the subject of his specialisation. Employers should also check with their own staff: there might be some experts in the plant itself. They will be of great help in imparting an analytical approach to the employees. Good magazines on technical and management subjects should be subscribed for and circulated among employees, who should be encouraged to form review clubs.

* Jaipur Metals and Electricals

It is, however, the Industrial Engineer who is in the best position to be incharge of CRP. He should coordinate the various cost reduction activities. He should in turn have Cost Reduction Committees of appropriate persons who should work as a group in various fields. One group might be on Tools, another on Raw Materials, yet another on Methods. Let all members of a group put their heads together to analyse every activity in their respective fields. Questioning technique of what, why, who, when, where & how will give rise to alternative tool and product designs, methods etc. The economy and advantages of various alternatives should be evaluated and proposals formulated. A suitable suggestion scheme should be designed and installed. Cost Reduction officers should be nominated to help any person or group in getting information and assistance whenever needed.

There should be a general cost reduction committee with the Chief Executive of the Company as Chairman and Industrial Engineer as convener. The Cost Accountant should be associated with this Committee. When proposals have been properly checked at lower levels, they should be presented to this Committee. A number of sub-committees may scrutinise these proposals and submit their recommendations to the General Committee while will take immediate and final decision to accept or reject the suggestion in full or part. Care should be taken to see that this Committee does not meet too often to make it only a periodical get together of a few individuals, nor too late to delay decisions.

An implementation Committee should undertake the responsibility of implementing any suggestion when it has been approved by the General Committee. A Plan of action and schedule of implementation should be drawn up. This schedule should be regularly reviewed to detect and investigate delays, and corrective action taken. An important part of the job of this committee would be of breaking the resistance to change. This should be done by explaining and convincing the persons involved of the advantages of the change and persuading them to accept it. This should not show any sign of weakness. This should be done firmly, and not in a weak manner.

Follow up is essential after implementing any suggestion. Unless a constant check is made, people might again revert to old procedures as it is difficult to change habits. In certain cases, changes may need further modifications to make them adaptable in the prevailing circumstances. It is also essential to check whether predicted advantages are actually accruing in reality. The job of the Implementation Committee does not end after installing the new procedure but it must ensure satisfactory and smooth running of the same and it should be seen that desired benefits are derived out of it ●

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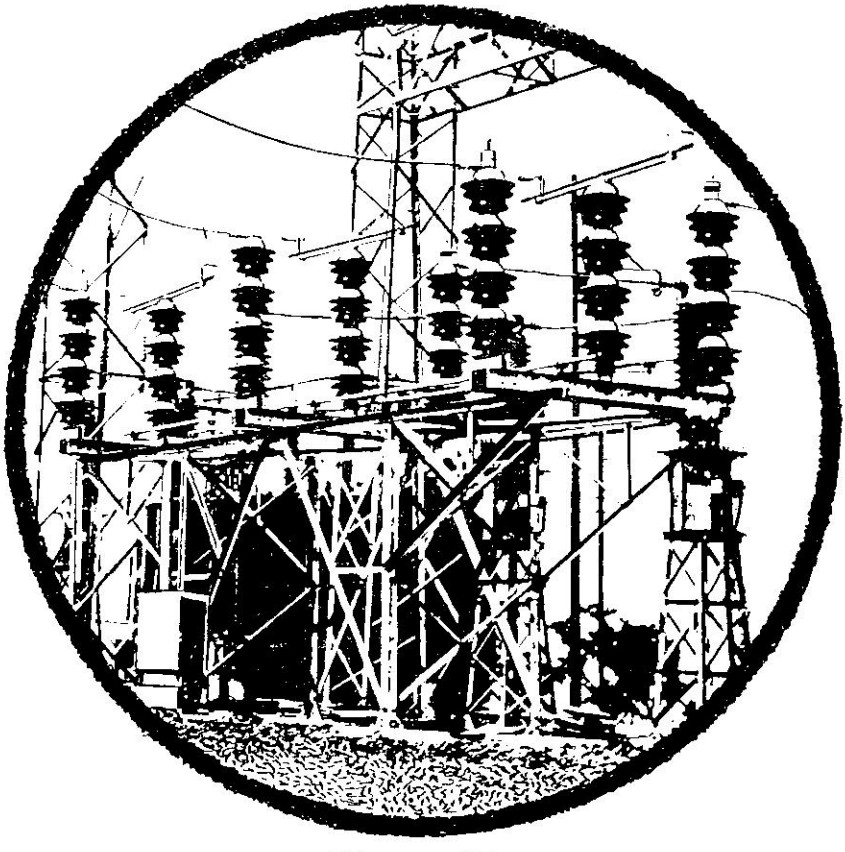

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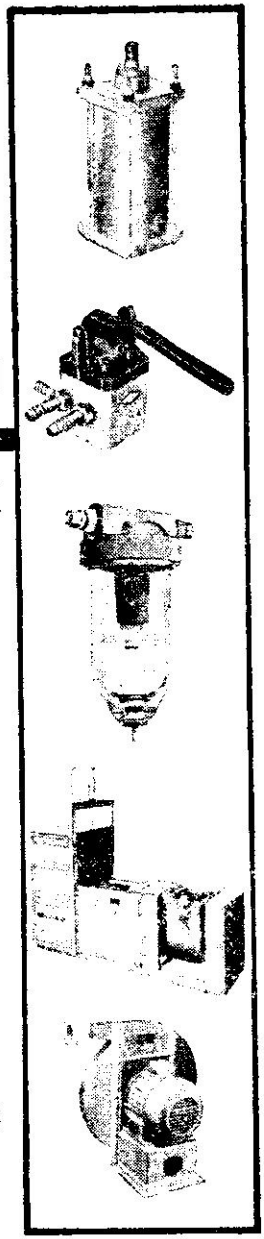

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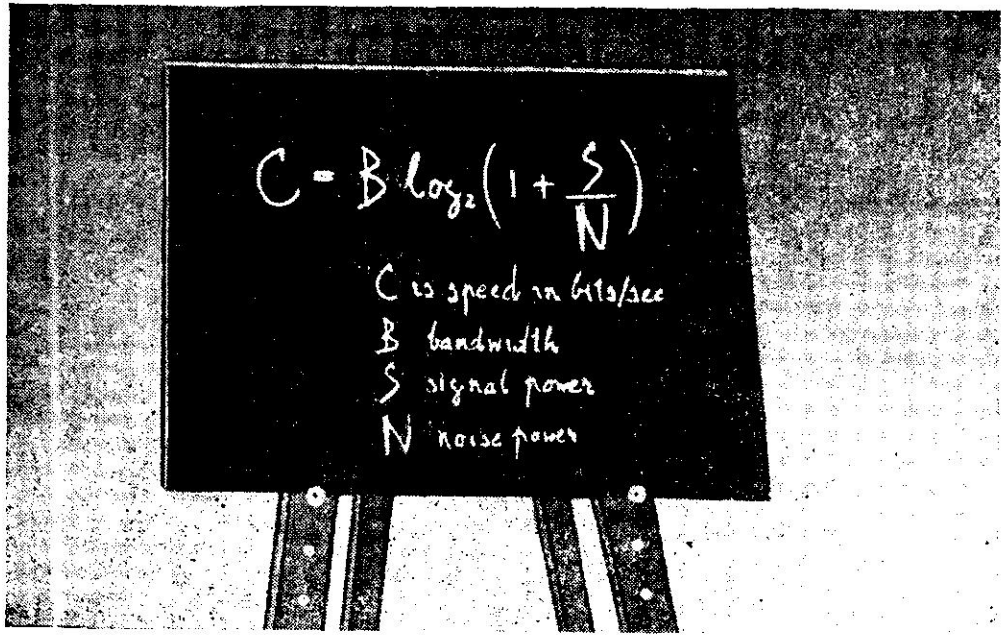

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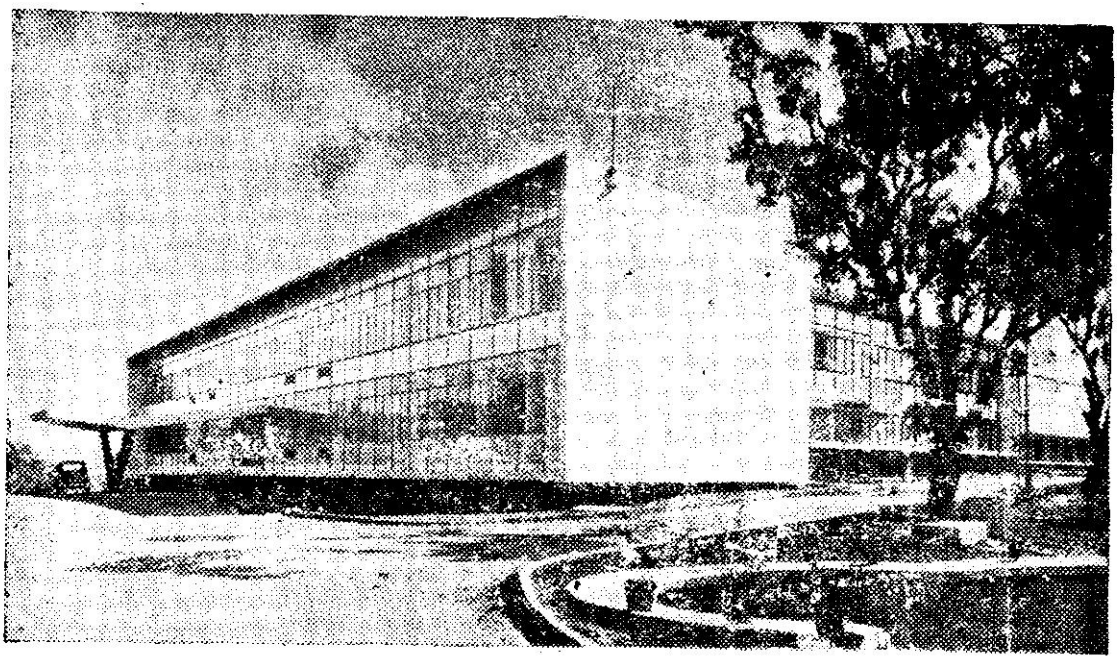

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The Secret of American Productivity

ADMITTEDLY AMERICA HAS BEEN LUCKY. Born as a free country, the freedom of each individual to think and speak and act as he chose (within the law) was a paramount tenet of the American Revolution.

America was also a rich country. Its enormous resources of land, water, minerals, forests, and moderate climate meant that men, by exploiting these resources energetically, could not only survive—they could prosper.

Nevertheless, the resources of America were not easy to exploit. It took sturdy and determined and resourceful pioneers to take the wilderness, to establish agriculture, to find, remove and use the minerals, to develop transportation. Resourcefulness and inventiveness were necessary—and they paid off.

They paid off ! That was the key fact. The inventive farmer, or artisan or manufacturer or businessman could profit from his efforts. The profits were not confiscated by a king or by the State.

But the early Americans were not only ruggedly practical and resourceful. They were also, paradoxically, idealists. They were devoted to freedom; they were devoted to their families, their friends, their community. They founded churches and schools and colleges almost before the wilderness was cleared. They had a passionate belief in the life of the mind and of the spirit.

All these and many other things helped America to develop the essentials of a prosperous society. The great farms grew enough food to do more than feed the family—enough to sell to the nearby city and feed also those engaged in manufacturing, in transportation, in teaching, and in preaching—and eventually those in a host of service operations and professions.

Yes, America was lucky. It had a sound base of resources, incentives, and ideas on which to build a scientific-technological society.

Historically, America was lucky, too. The colonists were just getting well settled in what is now the United States at the time of Galileo and Newton. The steam engine was developed in Europe just after the American Revolution—and it soon became literally the driving force behind the new nation—powering its factories, its railroads, its ships, and its agricultural machinery.

The devotion to education was surely a mainspring of American life and American progress. Harvard was founded in 1636, and by 1776 eight other colleges were operating in the 13 colonies. These, and their many successors, served as the channel which fed the surging intellectual revolution of Europe directly into American life.

The Morrill Land-Grant College Act of 1862 established our system of state universities—charging them first with the study of agriculture and the mechanic arts. This

move was a radical break with the European university tradition which then—and for many years later—ignored the "vulgar" practical type of learning and investigation.

Yet it was a bit strange and contradictory that these burgeoning schools of engineering and agriculture so long ignored the study of science itself. America left that to Europe—and even up until the 1930's European universities far excelled the American universities in study and research in science. America produced great inventors: Robert Fulton, Cyrus McCormick, Alexander Graham Bell, Thomas Edison. Europe produced the great scientists—Helmholtz, Maxwell, Rutherford, and many more. That imbalance, of course, has been dramatically reversed in the past 30 years—to the vast benefit of America and of the whole free world. Today the majority of the Nobel prizes in science go to America.

I need not review what has happened to America in these past 30 years. It is a fabulous story. The fabulous part of it is the remarkable three-way partnership that has developed between education, business and government. It has been the keystone of our economic development, of our security—and of our determination vastly to improve our society and the living conditions for all our people.

The partnership between science and technology—as between the university, government and industry—proved itself during World War II and has continued since. Industry has multiplied its own basic scientific research, has made it a point to have its scientists keep in close touch with university scientists, has helped the universities to improve their scientific and their educational programme. And wherever one turns in modern America one sees the result of the collaboration. Whether one looks at computers and automation, at new plastics and alloys, at new techniques of measurement and control, at new pharmaceuticals and medical practices, at supersonic airplanes and spacecraft travelling to the Moon and Mars—one sees the fruits of science and technology, working together and interacting.

Paradoxically, modern technology and modern science require so much capital that old-style capitalism could not possibly supply it. So, in those areas where science and technology lead demonstrably to a national benefit, large investments of government capital have been made. And they are going to pay off.

We know now that the physical universe is a vast and a vastly complex thing. We know that for centuries to come we can be learning new things—and facing new puzzles. But we have the tools and the experience to proceed. We know now also how to use our knowledge.

But as we pursue science and technology even more energetically, there are other problems to which we must also turn our attention. Growing technology and growing population have created new problems: air and water pollution, congested highways and airports, city slums. There are many industries which new technology has hardly touched. And finally to have prosperity at home and poverty abroad is not a situation in which Americans find themselves either comfortable or safe.

How do we tackle these problems? Some of them require new technological inventions. But most of them require new social, economic or political inventions. Can the nation be as ingenious in finding these as it has been in technology? These problems are much tougher than technical problems. The scientific method—as such—is not applicable. But human ingenuity is applicable. And the problems cry out for ingenious answers. To discover answers—to get new ideas—is not primarily a matter of money. Exploiting and using the ideas may be.

Productvity in China

Genko Uchida[1]

For very obvious reasons, we are vitally concerned with the level of productivity attained in China. The author is a Japanese intellectual, who has sought to measure China's technological progress against the background and by the yardstick of his own country, Japan. There is also an obvious American slant in the analysis. The piece, therefore, has had to be severely 'concised' to render it precise, 'objective' and useful for the policy-makers in India, and for a general understanding of the Chinese Economy, very essential in a democratic country like India, with vital interests at stake.

CHINA'S PRESENT NATIONAL INCOME IS estimated to be about $100 per capita (compared to India's $44 per capita) or $60 billion in total for her estimated 600 million[2] population. Most of that income, of course, comes from agriculture, but she has entered the industrialisation stage. If she follows the experience of Japan, *she will soon accumulate enough technical knowledge and capital to make a breakthrough* into a period of rapid economic growth, a growth that is driven by industrial investment. In ten to fifteen years she might attain a per capita income equal to Japan's present figure ($620). In that case China's gross national income would be about seventy per cent as large as that of the U.S.

How far off is the impending breakthrough for China? My own estimate is five to ten years. One may wonder, of course, whether the recent political convulsions in China will affect this time table. In this connection I shall observe that Japan also suffered from similar political instability in the years before World War II. Thereafter the pace of her progress towards industrialisation was quicker.

In a fundamental sense China is more a "developing" country than a communistic one. That is to say, her economic policies are rooted primarily in her needs as a still poor, backward nation....

China today has a well-organised establishment for the direction of science and technology. The new generation of engineers that China is producing is an impressive national asset. The profession is not limited to men; it is attracting increasing numbers of women. China's young engineers are confident, ambitious, eager to learn. They are acquiring, mainly from foreign publications, a detailed theoretical knowledge of the latest advances in technology...She has succeeded in copying many sophisticated machine tools of the U.S.S.R., Germany, the U.S., Switzerland, and Japan...she has begun to seek technical assistance and knowledge from non-Communist countries.

China's iron and steel industry is a mixture of large-scale and small-scale

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[1]International Economic Secretary, Ministry of International Trade and Industry, Government of Japan; also a member of the Ministry's China Study Group.

[2]This appears to be an old figure, for reputedly China's population is presently estimated at 700 million: this would correspondingly affect the per capita calculation...—**Editor**

operations, of modern methods and primitive ones. In her hurry to industrialise, the new Chinese nation urged the farmers to turn to making iron and steel in their spare time. Some 400,000 small shops, hardly more than smelting sheds, sprouted all over the country. Not many have survived, yet it is significant that these small mills supply about a third of China's pig iron and steel; and they remain politically important because they enable farmers to contribute to the nation's industrialisation. China has recently signed a contract with several companies in West Germany to obtain a complete rolling mill for the production of thick steel plates.

China's fertilizer industry is already sizable: she produces some 7.5 million tons of chemical fertilizer a year. This is still far short of her needs, however, She adds to her own production by importing upward of four million tons a year (which makes her the world's largest importer of fertilizer): the total supply amounts to twelve pounds per acre of cultivated land, which though low by European or Japanese standards, is still much higher than India's.

From Japan's experience it can be predicted that China's next stage in the development of chemical industries will be based principally on the extraction of products from coal tar. Like prewar Japan, China still depends on coal as her main fuel (although large oil fields are reported to have been discovered recently in Manchuria). From coal tar the principal products one can obtain are dyestuffs, drugs, and gunpowder.

There is evidence that China is already launched on the "tar age" in chemical production. She has begun to produce pesticides in substantial quantities for her agriculture, and we can reasonably guess, even without specific information, that she is not neglecting explosives production.

After the tar age comes the age of synthesis, meaning the production of new chemicals from basic raw materials. Japan entered this stage only twenty years ago, after World War II. China, although still in the early phases of the tar age, has made a beginning in the establishment of synthetics industries. She has been able to do this by importing complete plants from abroad.

The Chinese chemical industry is now producing perhaps 60,000 to 70,000 tons of plastics a year, including some 25,000 tons of vinyl chloride and small amounts of synthetic fibres such as rayon and nylon. In petrochemicals, China has recently made a beginning by entering into contracts to buy oil refining plants from Italy, West Germany and France.

China is making an effort to speed up development of a wide spectrum of chemical industries by buying plants of various types from Japan, Italy, the United Kingdom, France, the Netherlands, and West Germany. Experience has shown, however, that a country cannot make great progress in industrialisation until it has acquired the ability to build its own equipment. China is now taking the first steps towards such self-reliance in chemical technology. For a vinyl chloride factory in Peking the Chinese constructed the carbide electric furnaces, electrolytic chlorine cells, equipment for the synthesis of chloric acid, and equipment for the synthesis and refining of the monomers that are linked to make vinyl chloride.

They had to import from West Germany, however, the polymerization equipment that joins the monomers into the final product. The polymerization division has 2,700 employees, which seems a very large number, but the management explains that most of them are trainees who will staff new plants to be built soon.

Obviously the clearest index to a nation's industrial development is the state of its machinery industry, because this must supply

the tools for all other industries. In the production of machines, China presents a mixed picture: she is well advanced in some fields, far behind in others.

As in the chemical industry, in launching a machinery industry a developing country's first concern must be the needs of agriculture.

The Chinese have put great emphasis on the production of farm tractors. A single large factory in Loyang is turning out 300 to 400 45-horsepower tractors a month, plus some power shovels and graders. The production cost of the tractors is reported to be about $10,000 a piece—thirty to forty per cent higher than the standard in industrialised countries.

In addition to her tractor factories, China has a great number of small factories throughout the country producing other agricultural machines and implements. She has also developed a substantial industry in the manufacture of pumps, which are used to a large extent for agriculture.

A pump factory in Shanghai is mass-producing about 2,000 rotary pumps a month. In size (up to 1,600 milimetres in diameter) and design (applying the latest hydrodynamic theories), the pumps are quite modern, and so is the equipment employed in producing them, except for the final testing instruments.

One of the early requirements for an industrialising country is the production of machinery for transportation—a vital necessity for the exchange of products between the agricultural and industrial sectors. China began to build locomotives fifteen years ago and is now reported to be producing almost all her supply of these machines in her own shops.

After the initial development of elementary machines for agriculture and transport, the next stage for an industrialising country is the production of machine tools and major power sources, which entails the making of boilers, turbines, and heavy electrical machinery.

China has entered this second stage. Many of her factories are equipped with modern tools that were imported from various countries : East Germany, Czechoslovakia, Switzerland, West Germany, the United Kingdom, France, and Japan. China herself is beginning, however, to produce machine tools of her own; and some of their experiments are on a grand scale. For example, in a machine tool factory in Shanghai, they have put all the operations, from machining of the various parts to final assembly, in one huge, temperature-controlled room—perhaps the largest room in the world for making machine tools. With increasing sophistication in the techniques and synthesis of the various operations, this room might eventually turn out the world's best machine tools. In the production of Transport Equipment, China has one mass-production plant in this field : a factory in Changchun that turns out 2,000 trucks a month. China has begun to produce small planes by herself, copying Russian models. Her laboratories have recently built some analogue computers.

How About Productivity?

"There is no god for Government, there are only rules and regulations"

—From 'This India' in the *Yojana*

Productivity and Labour in Japan

Roderick Macfarquhar

AS IN BRITAIN, SECTIONS OF THE POPULATION have it pretty bad but, unlike Britain, Japan's economic growth since the war has been extraordinary and standards of living have in general risen sharply. In 1946 Japanese industrial production had fallen to just over a quarter of what it had been before the Sino-Japanese war began. The pre-war level was regained by 1951 and by the early Sixties the level was over four times what it was in the Thirties. Between 1953 and 1961, industrial production grew at an annual rate of 14.4 per cent, which compared very favourably with West Germany's 8.3 per cent and spectacularly with Britain's 3.3 per cent. The impressive aspect of Japan's performance is that it is not simply post-war recovery compounded by the Korean war boom, though both these were factors in the early years. Gross national product grew at an annual rate of 9.5 per cent throughout the Fifties (West Germany: 7.6; UK: 2.7) and, in spite of stagnation in 1965, the GNP went up another 9.7 per cent last year. These have translated themselves into considerable benefits for the common man. Though wages are still low by European standards—a working class family of four to five members has a combined weekly income of about £9 after tax—consumer spending rose annually by an average 8.8 per cent in real terms between 1956 and 1964, and last year went up a further 13.2 per cent.

Clearly government policy and planning have played an important role, notably in backing the loan policies of the commercial banks. The Left say that the Japanese miracle is built on uncertain foundations—the ending of the Vietnam war boom might set it back considerably. The Right see the JSP's* chance as lying less in the possibility of economic disaster than in presenting fairer schemes for the division of the national cake. Social justice is the watchword of the Right, the narrowing of the wages gap between top and bottom, town and country, and better social services—derisory by European standards.

The decisive factor in shaping the outcome of the forthcoming debate will probably be the behaviour of the trade unions. The JSP is heavily dependent for funds and organisation on Sohyo, a federation dominated by the railway workers, teachers and government employees. With 3,800,000 members, Sohyo is still the largest federation of unions but its strength is declining, whereas Domei, which has 2 million and supports the Democratic Socialists, is growing. But the future direction of the labour movement will probably be decided by the still politically-unattached International Metal Workers' Federation (Japan Council). The IMFJC is relatively new and has only a million members, but it draws them from expanding industries like chemicals, machinery, electricals, cars, oil and steel. If the IMFJC, which claims to be more interested in economics than in politics, merges with Domei, then the rightward swing of the labour movement will inevitably have repercussions on the JSP.

Perhaps the fundamental problem for all Japanese socialists is the dual nature of their society. On the one hand there are the workers in modern industry who are doing reasonably well by local standards and who therefore see no reason to vote for the JSP; on the other hand, the less well-off peasantry

* Japanese Socialist Party.

have an almost feudal loyalty to the Liberal Democrats. Only in the aftermath of a shattering national defeat were the socialists able to make any headway against this combination. Now they have to decide whether all their principles are immutable and then wait patiently for economic Armageddon; or discard those ends which are in fact means, forget the Thirties and reshape their programme in terms of current realities.

Productivity at Home and Abroad

Among the cultural norms that I sensed, aspects quite different from those in America were—the attitudes towards time, towards work, and towards conformity.

For instance, the idea of spending a morning or afternoon with no plan, no scheduled activity for oneself, whether it be duty or pleasure—the idea of just "drifting" through a few hours is something that Indians appreciate the value of and take full advantage of.

Americans, however, are in general hostile to unplanned, unfilled time, and we regard it with disdain, or puzzlement, or we dismiss it as wasteful.

Attitudes towards work are another example of a strong difference. The idea of getting "one's hands dirty" or doing work which produces "good honest sweat" is regarded with slight horror by most Indians as something to be avoided at all costs. On the other hand, many Americans choose such activities for their leisure time which tend to be dirty hard work, e.g. heavy gardening, building, tinkering with automobile engines, and the ever-popular "do-it-yourself" kits.

(From Marcia Donovan's recorded experiences of her life at Shantiniketan)

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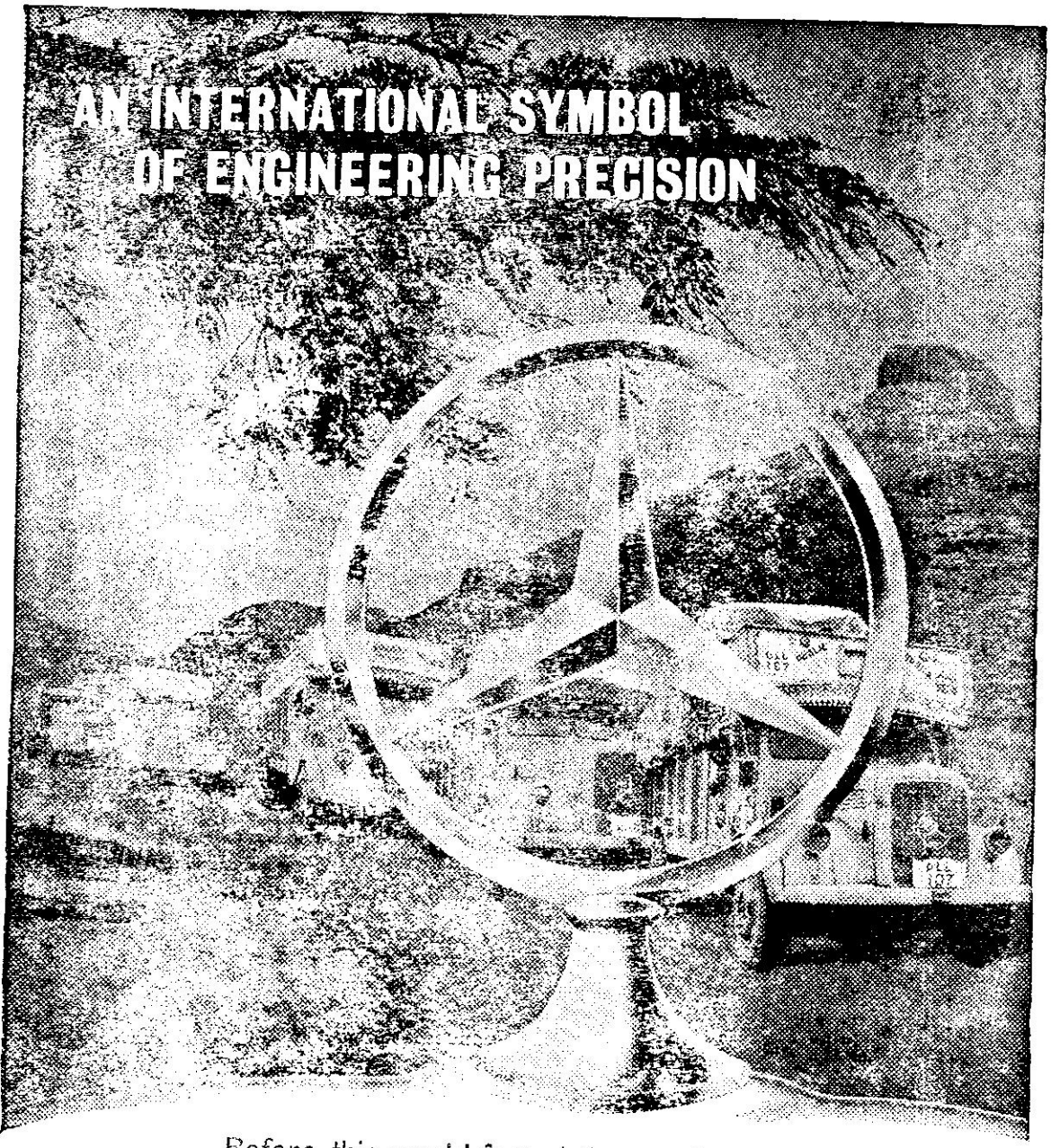

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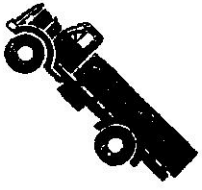
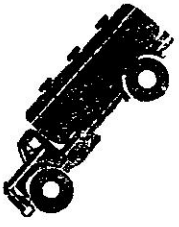

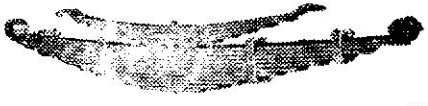

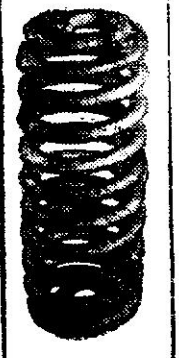

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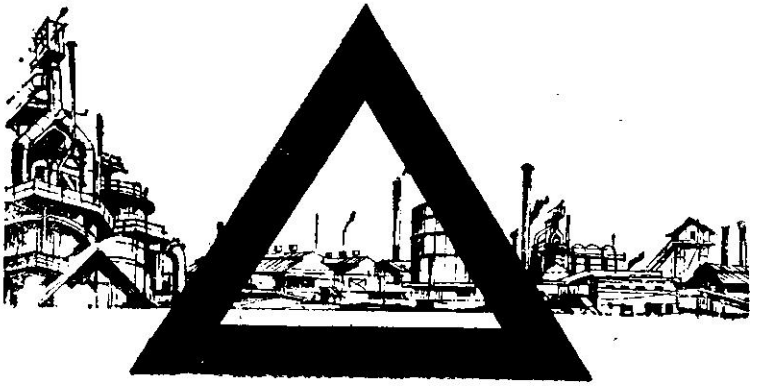

AT JAMSHEDPUR, SAFETY IS PART OF THE JOB

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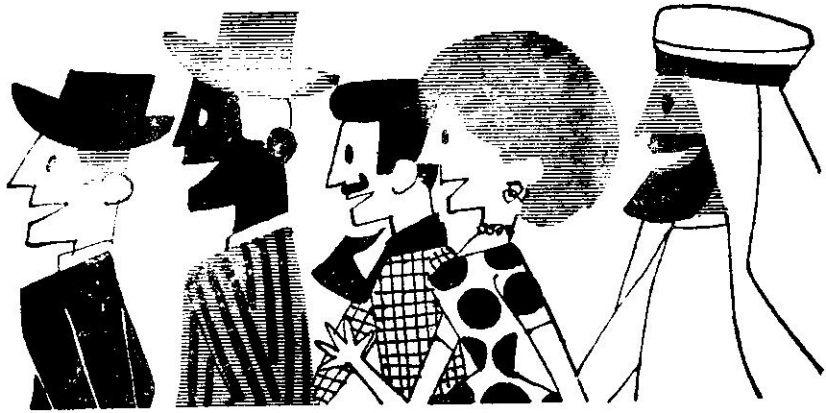

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Editor's Correspondence

Small-Scale Radio Industry

Electronics Industry in the small-scale sector produces nearly half the country's requirements of radios and transistors.

The time has now come, when we must give our earnest attention to the following factors :

(a) Improvement of quality of our products

(b) Maintenance of quality through stricter quality control measures

(c) Have better productivity in our manufacturing processes

(d) Develop new circuits, products etc.

(e) Provide training facilities to the technical staff

(f) Provide and promote research facilities.

Realising the importance and urgency of these proposals, the Small-Scale Radio and Sound Equipment Manufacturers Association has appointed a sub-committee called 'Research & Training Sub-Committee'.

To achieve its aims the sub-committee desires to explore resources and possibilities for :

(1) Setting up, in Delhi, (a) an Electronic Testing Laboratory, (b) an experimental workshop, (c) a Museum of samples and prototypes and (d) a Technical Library of books and literature, record of up-to-date information for research, development, quality testing and training of technical staff.

(2) Formation of a panel of technical intelligentsia of the Industry, who should periodically meet, discuss and solve the technical problems of the Industry and act as an advisory body on industrial technical matters.

(3) Fostering of technical knowledge and know-how by arranging lectures, discussions, visits etc. This will provide opportunities for the technical staff to renew, refresh and enlarge their knowledge which otherwise stagnates.

(4) Organisation of refresher courses.

(5) Establishing a Bureau of Information.

In this connection, we desire to use the good offices of the Productivity Journal to contact persons interested in this line. They may write to us their views in these matters, the facilities they can offer, and the problems they face and would like us to tackle etc etc. . . .—**K.V. JAIN, Hony. Secretary, R & T Sub-Committee, Naiwala No. 5, Karol Bagh, New Delhi-5.**

Impact of Automation in Industry

Mr. Rathor's paper on 'Automation: its Impact on Management Decisions and Industrial Relations', published in your 'Productivity' journal (Vol. VIII, No. 1) was found to be interesting. The question that comes to the reader's mind is whether automation is suited to Indian economy at the present moment.

Personally I feel that mechanisation/automation for Indian industry and economy is not opportune at the moment and never with imported machinery for it. Even the mechanised western world of today is the outcome of a few decades of gradual change-over—almost a gradual metamorphosis, achieved through their own machinery and know-how. India cannot even dream to have automation introduced overnight, and if she tries to have it overnight with foreign aid, it would only prove to be, in my humble opinion, *a suicidal quixotic attempt, detrimental to her national economy and industrial peace.*

With the introduction of automation the demand on the factors like higher skills, knowledge, intelligence, etc., increases considerably and that on manual work of low calibre reduces drastically. If a balance of manpower employment is to be maintained in industry or in our country, the labour displaced as a result of introduction of automation must be absorbed elsewhere or else it would only add fuel to the fire of unemployment already raging in our country. Opportunities to displaced labour could be provided by:

(a) setting up new factories for manufacturing automation equipment on the one hand, and

(b) by imparting training to develop themselves to man new posts in mechanised/automated factories on the other hand.

While the former proposition would require setting up our own industry for manufacturing the automation machinery, the latter would call for provision of facilities to train up and educate labour at large, for new jobs. The existing labour being generally illiterate and of low calibre, the latter course would pose stupendous problems on a national scale.

The former alternative may be solved by making a decision as to whether or not to introduce automation in a certain industry and this decision should be made by the respective industrial association of manufacturers in consultation with the concerned trade unions by taking the latter, into confidence. Once it is agreed to go in for automatic for a particular industry, which may be a difficult agreement to arrive at, the respective manufacturers may collectively set up a factory or two for manufacturing automatic machinery required by their industry, thus providing alternative employment to at least a part of labour likely to be displaced as a result of automatic. The

respective industrial associations may, with some aid from the Government, if necessary, institute suitable training centres or programmes to impart training in automated jobs to those interested and capable, or having potential.

It is a well established fact that automation does enhance productivity and the standard of living as evidenced in the western countries. If our industry wishes to improve its productivity and earn higher returns, then it is only fair that in its own interest it should come forward to institute, maybe on a cooperative basis, the manufacture of its own requirement of automation machinery. It is the joint, cooperative and national approach by industrial management, labour and the Government that might be able to help introduction of "Automation Without Tears" in our country, should all the three and through them our nation at large, benefit from it.

These are my personal views and not of the Company I belong to . . .—RP NADKARNI, **Voltas Limited, Ambedkar Road, Bombay-33**

In Defence of Automation

I for one do not agree with Mr Nadkarni's views that switch over to mechanisation/automation would be detrimental to the Indian economy. I would like to draw the attention of my learned friend to Japan's economy (an eastern country like ours). During World War II Japan was practically finished but in two decades Japan has much advanced in the industrial world and now is one of the most advanced countries of the world, with expanding economy and favourable balance of trade. Japan after World War II started mechanisation/automation with foreign aid (American Aid) and now it is on its own. No wonder that many 'Made in Japan' goods have captured the American markets and many factories in U.S.A. on this account are closing down. Transistor radio sets may be cited as an example on the score.

When Japan, with no raw materials of its own (all imported), could reach this height in the industrial world, I wonder why in India we cannot do the same thing. After all it is now 20 years since we got Independence; and what we have achieved is known to us. This is my own feeling that *we Indians always have some excuse to make that it would suit the U.S.A. or Japan but will not suit Indian conditions. Traditionally we are a lethargic people* with a big resistance to change and with no national character: I imagine these things could be the prime bottlenecks in introducing mechanisation/automation.

I have already spelt out employment positions in my article that automation will increase the number of skilled jobs over the long run provided our workers adapt themselves to the improved technology. The installation of computers in Life Insurance Corporation of India is an example. However, we have got to educate and train the workers and if they do not develop or adapt to new conditions the only way out is to get rid of them and have new blood which is more adaptable. In the beginning there may be some labour unrest but training would automatically adjust the things.

It may be emphasised that this is the age of intercontinental ballistic missiles and when other advanced countries are planning a trip to the moon, I wonder how in India we could afford to run around with the bullock cart etc. By the same token today industry is also operating in a complex and competitive industrial environment and if we do not replace the traditions, rules of thumb, by mechanisation and automation, I am

afraid we will not attain the higher Productivity which is very important for the economic stability and prosperity of this nation. . . .—BS RATHOR, **Lecturer, Deptt. of Commerce, Panjab University, Chandigarh.**

Industrialisation in Kerala

The article, Management Development, Industrialisation and Productivity (Vol. VIII, No. 1, Summer 1967) draws attention, with reference to Kerala, to a problem which demands and needs immediate attention.

I would like to make the following observations on the subject:

1. Mr. Pylee has stated: "If one looks upon education as an investment in developing the most critically needed human resources, then top priority cannot and should not be given to mass attack on illiteracy, but to the quickest spread of technical and vocational training which will help production and productivity." Editor has drawn our attention to the incongruity in the statement in that without a mass attack on illiteracy, technical and vocational education is not possible.

To this I may add that mass attack on illiteracy and large scale provision of primary education has helped rural masses to free themselves from superstition and to develop a healthy attitude to agriculture and various problems of life.

Whatever be the job a person is engaged in, literacy and basic education will help to develop the right attitude to his work in terms of productivity and growth.

2. It is necessary for us to have a "professionally oriented managerial elite or class" as in advanced countries as suggested by the author. For this the attack should be on the large number of arts and science colleges.

It is most desirable that many of our arts and science colleges in Kerala are converted to management and technical schools with provision for on the job training. To attract the right young men to such technical and management schools there should be aptitude test and vocational guidance at high school level.

3. In Kerala we find young men attending arts and science colleges in anticipation of getting a good white collar job. After graduation when they find their efforts to find such a job futile, they become frustrated. Finally, they go in for such jobs as office peons, attenders, lower division clerks or bus conductors.

In respect of a large number of such young men, I feel that the higher education they had was a personal and national waste.

As they are a band of frustrated young men their efficiency on such jobs as above is far less than that of a less educated person.

4. Editor has suggested that the educated manpower of Kerala can be used in the services of education and health facilities in several states of the Indian Union.

I doubt whether the large number of arts and science graduates turned out every year by Kerala could find employment in other States. Anyhow, this matter deserves to receive the attention of N.P.C. for further studies and research in the interest of making the best use of our educated manpower . . .—K. KUNHAMOO, **Manager, Aysha Hosiery Factory (P) Ltd., P.O. Palaparamba, Kuttaparamba.**

recent literature on productivity

WATCH YOUR COSTS

MK Rustamji*

TELCO HAS BROUGHT OUT A MAGNIFICENT hard cover illustrated Book on Watch your Costs. Its 51 pages are a treat; and if anyone wants to have an idea of the publications of the future, he must see this Book. Pictures speak more than words; and these words are few: words of wisdom and advice, given with telling good humour. The Book shows what money can produce in modern times: incidentally, there is on page 19 a very beautiful illustration on money going down the drain. Mr. MK Rustomji, the architect of it all, has been able to manage a message from the Prime Minister, Srimati Indira Gandhi: this, of course, is decorative...Apart from his genius in writing cryptically and with punch, Mr. Rustomji just seems to hit the truth, as with a hammer on the nail, sharply, precisely. Much need not be said of Roma Chakravarty, for with colour and line, he has literally spread life on every page. It is probably the only Book which, because of Roma Chakravarty's illustrations, one likes to see backwards and forwards, look closely into faces, which in spite of outrageous caricature, seem so real. What probably is more significant, situations appear so life-like in colour and contour which just could not have been done otherwise. We hope his charges will not go up but Roma Chakravarty of J Walter Thompson is really a genius in the line. He it was who illustrated our book on Business is People. It is legitimate that we call it our book because we first published it and sold it on a large scale. Similarly, Watch your Costs, with an introduction by JRD, was really first published by us in Volume VII, No. 4 of NPC *Productivity* Journal, but not a word of this has been mentioned by our friend Rustomji, though it was at his instance we did it. This is Productivity and Modern Enterprise, and for that we congratulate him. Incidentally, no price has been mentioned in rupees nor in dollars, unless it be

*Chief Controller of Accounts, Tata Electric and Locomotive Co., Jamshedpur.

in invisible ink; or it might be ultra-modern productivity, that the price be specially stamped for every customer and for every country. In this very issue we have reviewed a Book whose internal price is printed as Rs. 10/- and the dollar price as 3.50, which means a dollar is equal to Rs. 2.86: a highly productive Indian technique devaluing the dollar itself and to half the pre-devaluation level! Probably some of the costs for the lavish printing of Watch Your Costs may by this technique be recovered from Uncle Sam. At whatever price it is sold, every Indian manager and every foreman ought to be presented with this book at the Company's expense, and it is probably the only book, besides *Business is People*, which even workers would like to take home; so artfully has it been illustrated that even illiterate women and children can follow what is said about high-sounding Cost and Budgetary Control Techniques. We in NPC stand to learn from this publication how effectively productivity techniques can be communicated.

Indian Petroleum*

THIS IS A MINE OF INFORMATION, SHOWING the long distance we have travelled since Independence. It gives complete information regarding exploration and oil production, oil refineries, pipeline projects, marketing organisation, petrochemicals and allied industries, research, training and educational facilities. All this information is given against the background of developments in the world petroleum industry supported by a mass of statistical tables running over more than 70 pages. It shows how the Government of India is involved in a large-scale programme of exploration, production, refining and distribution, with active participation in almost all the phases of the oil industry. Geological and geophysical surveys which in the British period were limited to Assam, now extend over Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Punjab, Andhra Pradesh, Madras, Kerala, Gujarat, Madhya Pradesh, Rajasthan, Andaman islands: they also extend to Nepal. Besides, offshore seismic surveys have been done with the help of Soviet experts in areas off the Coromandal coast and in the gulf of Kutch. A French seismic party was engaged in exploration activities in Jaisalmer areas. Oil from the Ankleshwar field is being refined at Koyali. Natural gas from Cambay field is being supplied to the Dhuvaran Thermal Power Station in Gujarat. Gauhati Refinery operating on indigenous crude has not only attained full throughput but is being expanded. The Barauni refinery has now been expanded to three million tonnes. The Kyyali refinery has also reaehed the ultimate capacity of three million tonnes. A 2.5 million-tonne refinery has been commissioned at Cochin. The private refineries have also been allowed to expand. A number of pipelines have been constructed. The domestic oil position has been further strengthened by imports of kerosene and diesel oil from the Soviet Union, marketed through the Indian Oil Corporation. To provide engineering services in the development of petroleum, petro-chemicals and other industrial programmes a new company named the Indian Engineers Limited has been set up with American collaboration, Government of India holding 51 per cent shares.

**The Indian Petroleum Handbook* : published by the Statistics Division, Petroleum Information Service, 22, Pusa Road, New Delhi-5, pages 164, price Rs. 2/-.

The Research & Training Division of the Oil and Natural Gas Commission has been strengthened with the assistance from the UN Special Fund. The Indian Institute of Petroleum at Dehradun conducts refresher and diploma courses in petroleum technology and also does research in investigations and studies in petroleum refining, petrochemistry, product applications and other allied subjects.

In fact, *taking all in all, the public sector in the field of oil is doing* an almost *magnificent volume and quality of work.* At the time of Independence this country was producing about 2 lakh 50 thousand tonnes of crude oil. Now, entirely due to the enterprise of the public sector, we are producing three million tonnes of crude oil; and even this figure may now be outdated. When it came to oil refineries and the only alternative in the beginning was to persuade foreign oil refineries to invest in India, Government did not hesitate in offering generous terms, to let the things go ahead. Subsequently, a number of refineries have been opened in the public sector itself so that in all we have seven oil refineries operating in the country, plus one under construction and two more in the planning stage. A vast marketing organisation has been developed, and the expansion can be seen from the fact that during the four years ending 1964-65, the value of products sold by the Corporation rose from less than Rs. one crore to nearly Rs. 100 crores; and this figure must now have been exceeded.

What is more important from the point of view of economic development is that based on oil, a number of petro-chemical and allied industries have and are coming into being on a pretty large scale: this is in turn leading to a vast expansion in investment in a wide variety of lines both in the public as also in the private sector, through the utilisation of hydro-carbon and gases for the production of plastics, synthetic rubber, synthetic detergents, insecticides and pesticides, synthetic fibres, carbon black, and a number of other products: also the manufacture of fertilizers based on naphtha and associated gas.

If there are evidences of take off, it is much in evidence in the field of oil. Though probably no productivity studies have been done in the field, yet it is only too apparent that with a comparatively small investment, a whole new oil industry has been born and is functioning at a rising tempo of activity. By the mid-1970's, India will be a modern oil economy, supplemented of course on a fairly large scale by a rationalised coal industry at one end, and nuclear power at the other.

Modern Productivity

In 1950 a brilliant student in the USA took two years on a desk computer to do a quantum-mechanical calculation that was done five years later on an electronic computer in fourteen minutes. By now, the time required to do this calculation, once a machine has been programmed for it, is probably less than one minute.

Productivity in the Printing Industry*

AS EVERY PRINTER KNOWS, ANY ISSUE QF the Print Bulletin is a treat on account of its colourfulness, etc.. etc., From the point of view of the National Productivity Council, however, this special issue has a significance which we have to take note of. The very cover page breathes productivity: in a colourful diagram, a possibilty has been indicated by which the overall printing process time could be reduced by as much as two-thirds: over 1/4th by appropriate production planning, care of plant, work measurement, etc; almost in equal measure through improved morale, incentive methods and again work measurement; nearly as much through motion study.

Below the diagram, we have the picture of a master printer, with black goggles but no eyes, dressed out like a lawyer and holding out a white card in a somewhat officious manner. He seems to have been *modelled on a Peter Durcker* formula: "There are few worse cost leaks than the office manager who keeps his staff waiting in the morning until he has read and sorted the mail only to put pressure on them in the afternoon to make up for lost time."

We welcome this issue of the Print Bulletin, particularly because it is wholly devoted to productivity. It begins with an excellent editorial on productivity as applied to the printing industry. As a tripartite organisation, however,—representing Government, employers and labour—we cannot go out of our way, as the Print Bullentin advises to inculcate "a sense of duty and discipline in the mind of the worker." If this is to be done, it can only be by the methods illustrated in the cartoons, reprinted from NPC book on "Business is People" on a number of pages of this special issue. The answer usually can be obtained from within. This very issue of the Print Bulletin has an excellent article on Productivity and Human Needs by Dr. (Smt.) Vaidya of the Bombay Labour Institute. There is another article on the Philosophy and Technique of Financial Incentives by Mr. Sapre of the Government Central Press, Bombay. So the men of the printing industry have the answer. It is for them to inculcate in their own workers whatever they consider desirable.

This special Issue has quite a number of knowledgeable articles including one by Cyril Spector, Head of the Department of Administration Subjects, London College of Printing, on Management Training in the Printing Industry. This excellent article has, however, been disfigured by an inadvertant entry of the printer's devil, in one of the significant passages showing the expansion of technical facilities in the United Kingdom: "At the top there has been the establishment of the two Business Schools at Manchester and London *when* the development of a number of graduate courses in business administration at the newer and older universities, *when* the introduction of the new postgraduate diploma in management studies which has been sponsored by the eleven new technological universities and another thirty colleges of regional technology and finally the large number of professional, functional and specialist courses provided by a hundred or more technical colleges." The italicised

*Print Bulletin Special Productivity Week Number, Official Journal of Brihan Mumbai Mudrak Sang, edited by Jayant G Deukule, New Prabhadevi Road. Bomb ay.

words make nonsense of the passage. It is rather surprising that this should have happened in a model printing magazine.

Historically this issue of the Print Bulletion reminds us of the team sponsored by NPC on the Printing Industry, more than five years ago. We are glad that the Print Bulletin has in the second editorial quoted from that report:..."With a view to making the management and labour productivity conscious it is suggested that the All-India Federation of Master Printers organise a productivity week every year, *when both labour and management can get together and discuss the advantages of higher productivity*. Films, posters, leaflets, etc., could be used for this purpose, Suitable rewards should be given to those workmen who achieve more than the stipulated norms, and their names should be displayed prominently in all the departments of the concern." The italicised words contain the answer to the problem of workers' cooperation, so strongly posed in the first editorial of the Print Magazine. The question is whether during the Productivity Week Labour and management did get together; whether they did discuss the advantages of higher productivity; whether the workers shared the gains of productivity arising out of a 25 per cent increase in output achieved at the Government Central Press as a result of the productivity drive.

We are glad that the Print Bulletin has posed these questions and we shall be gladder if the future issues of the Print Bulletin are devoted to a realistic and humanistic solution of the problems involved. We shall, of course, help. We commend this Special Issue to people in the productivity movement as also the printing industry, where the printers don't need our advocacy.

Viva in Economics*

WE WERE RATHER AGREEABLY SURPRISED to receive a book on Viva in Economics by an Agra Professor. Though one would wish that the young lecturer had spent his time in economic analysis rather than writing ready-made notes for students, it must be said that this is a good and handy book. The purpose of the Viva in Economics and how it should be faced have been dealt with in a straightforward manner, which any intelligent student of economics should be able to understand. The author has posed (and answered) quite a number of simple and straightforward questions on a number of subjects: economic planning, international trade, statistics, research, methodology, business economics, history of economic thought, transport, labour problems, monetary economics, etc., etc. The answers are short and precise, though not always correct according to pure theory. This, however, is an excusable defect in a book where

**Viva in Economics*, by Prof. AB Bhattacharya of Agra College, published by Bharti Bhawan, Exhibition Road, Patna-1 and printed at Tapan Printing Press, Patna, pages 158 including an 8-page bibliography of selected reports; price Rs. 3.50

answers have to be restricted, due to reasons of space, to a line or two or at the most 4 or 5 lines; and the book is meant not for intellectuals but for students who have just grasped (or probably not yet grasped) the elements of economics. The author has done his best to satisfy his clientele and the book is cheap at the quoted price...Nevertheless it does represent a little bit of a tragedy that young lecturers should be compelled by circumstances to cater to the market in this manner. It must, however, be said that it does answer a definite need of the market place. Universities are now manufacturing masters in economics; and some of the university professors have to take the Viva (not without remuneration) and some have to train the students either privately or through books of this kind. It does positively lead to a lowering of academic standards.

The Foundry Directory*

IN THE WAKE OF THE GALA INTERNATIONAL gathering of the World's Foundrymen, held in New Delhi in December 1966, the Institute of Indian Foundrymen have brought out a tome, containing a mass of technical and economic data which will be found useful not only to foundrymen as between themselves but also to men in industry who would be needing all types of casting facilities on an increasing scale; also to men in authority for purposes of economic development and regulation. The casting industry in India is an ancient one, as evidenced in the underground drainage systems at Nalanda, Mohan-jo-daro and other historical places. During the Second World War, there was an interesting story going round that the Americans were agreeably surprised that, even with crude instruments Indian foundrymen could make an exact prototype of the damaged parts of the most sophisticated military aircrafts: they had been given to understand by the British that the Indians were incapable of any type of manufacture requiring application and intelligence. Potswar industrial development in India, one important facet of which has been amply documented in this Foundry Directory, gives the lie to the fib that had been long developed by foreign rulers about Indians' incapacity to handle industrial matters of a complicated character.

This Foundry Directory is divided into three parts, dealing in the first instance with the industry itself, its potential, its future plans and demand projections, the export of foundry castings and machinery, raw materials, refractories, standardization and foundry accessories, education and research in foundry technology: all this material is supported by 15 pages of statistical tables, 20 pages of a glossary of foundry terms and another 20 pages of standard tables of information.

This information is followed by Part 2 which is a book in itself, consisting of 477 pages, 340 pages devoted to a detailed list of foundries in each State of the Indian Union, giving information about the type of foundry, employment facilities, metal cast specialities, capacities, etc. etc., The information is supplemented by tables showing metals cast by each foundry—alloy iron, alloy steel, malleable iron, pig iron, steel; and also nonferrous metals : bronze, copper, gun metal, light alloy, zinc, etc. etc. There is also a list of special foundries and of

*_Foundry Directory_ 1966, published by the Institute of Indian Foundrymen, Allenby Court, 1/2, Allenby Road, Calcutta—20, pages 850, price Rs. 65.00.

foundries started with foreign technical collaboration. An exhaustive list has been given of products manufactured by Indian foundries, such as agricultural and chemical castings, automatic castings, castings for cement and construction industry, castings for domestic appliances and weights and measures, electrical castings, engineering castings, castings for industrial plant and equipment, machine tools, machinery, municipal items, pipes and special castings for railways and tramways, etc.

This is followed by Part 3: Buyers' Guide to foundry suppliers, divided into Indian and international sections, each section containing a detailed list of suppliers, supplemented by a classified list of suppliers, relating to plant and equipment, furnaces, boilers, metals and alloys, testing equipment and materials, sands, clays, binders, foundry requisites and services.

Thus the Foundry Directory is no ordinary publication and the men who have laboured on it, besides those whose names appear on the volume itself, deserve congratulation. Probably the Directory could be a take off point for a valuable Interfirm Comparison as between the foundries themselves. In this context, the Editor of this Journal recalls having met an important foundryman at Bombay some years ago: he was anxious to organise through NPC, an Interfirm Comparison as between various foundries. It was found rather difficult at that time due to lack of preliminary information; now that this Foundry Directory containing exhaustive information, not only about names and addresses but also locations and facilities is available, it should be possible to organise an IFC with a view to push forward quality and output and bring about substantial reductions in the cost of production.

Productivity in Banking*

The publishers of this Journal have been good enough to put us on the mailing list. Normally, probably, there would have been no point in our reviewing a Journal of this character, not because it is not worthwhile—this Journal is a particularly good one—but because they deal with their own problems; and there would be little common ground, ordinarily, between *Bank Karamchari* and Productivity. To our happy surprise, however, we find that they have brought out a whole Productivity Number; and it is not merely that they have put the stamp of productivity on the cover, whatever stuffing they could manage. It begins with an excellent article on Improved Productivity —Banking Meets the Challenge of Growth; and Mr AH Elias, the author of it, certainly knows what productivity is, what growth is and how improved productivity in banking can contribute towards a higher growth rate. It is heartening to find it said in *Bank Karamchari*: ".. measures intended to increase the productivity of the staff in the sense of ability and willingness to increase the work done per unit of wage seem a hopeful line of action;" on the first reading, the reviewer thought, it read 'hopeless' line of action but later on found that Mr. Elias has actually written it as a hopeful line of action. Again, the article ends with this: "Productivity is new to Banking, perhaps more difficult to apply to banking but then it provides the only solution to the many

**Bank Karamchari* (Productivity Number), Journal of the All India Bank Employees' Federation, March-April 1967.

problems of banking. Through improved productivity alone will banking become more viable to meet the challenge of growth."

Then we have another article on Productivity and Trade Unions by George Meany, President of AFL-CIO. He too is for productivity but is careful enough to add a rider: "...rapidly rising productivity does not automatically improve living standards. It offers opportunities for improvement. Free trade unions and effective collective bargaining are needed to translate rising productive efficiency into improved living standards for workers."

There is a third article on Free Trade Unions—Face Productivity Problems by Alfred Braunthal, Assistant General Secretary of the ICFTU, who begins with what for us is a quotable sentence : "It is quite obvious that in modern society no substantial improvement in living standards, particularly in conditions of rapid growth of population, is thinkable unless the productivity of the economy as a whole increases."

Then of course we have Mr NK Bhatt's article on Productivity and Labour. He has written in true Gandhian style and in support of Gandhian principles of trade unionism. It is short but sweet in its approach.

Except Mr. Bhatt's article the other articles are obviously borrowed material: but whoever has borrowed has done so very intelligently and he deserves to be congratulated on the selection of the material.

Because of its productivity—or rather for its productivity—we congratulate the *Bank Karamchari* on its achievement.

Roster of Technical Translators*

Though called by a rather high-sounding name—the assessment of the translation potential in India for scientific and technological subjects—INSDOC must be congratulated on the preparation and publication of this Roster of Indian National Scientific and Technical Translators. The coverage in terms of languages is practically global. English has been excluded for very obvious reasons, being a sort of national language. The principal European languages covered are French, German, Russian (these appear to be the most popular amongst Indians) but quite a number of people know Czech, Dutch, Italian, Portuguese, Rumanian, Spanish, etc. One or two persons are listed also under Bulgarian, Danish, Hungarian, Latin, Norwegian, Polish, Serbo-Croation, Swedish and Ukranian. Very obviously, the coverage in the first edition in a country of this size and population would be much less than complete. It is expected the INSDOC will follow it up, as is clear from the registration and other useful cards included in the publication. It is socially significant that quite a number of women figure among the knowers of foreign languages.

The Eastern languages have also been covered: Burmese, Chinese, Japanese and Korean. Here the list is very obviously incomplete because there is just one name under Burmese, three under Chinese, and

*Published by the Indian National Scientific Documentation Centre. Delhi-12, pages 77. price not mentioned.

seven under Japanese. Probably the justification for this is that INSDOC was interested only in competent translators of scientific and technological literature published in foreign languages.

It is heartening to find that as many as 75 persons can competently translate foreign literature in chemistry, 49 in physics, 25 in mathematics, 15 in medical sciences: the figure rises to 144 for Engineering; yet for a country of continental size and population, the figures are rather small. The Roster contains a whole section on Subject Specialisation; and the list is rather impressive covering humanities, psychology, philosophy, social sciences, statistics, political science, economics, languages, astro-physics, physics, thermal physics, chemistry, physical chemistry, analytical chemistry, organic chemistry, geology, minerals, palaeontology, anthropology, microbiology, bio-chemistry, botany, plant physiology, zoology, entomology, pharmacology, surgery, engineering, mechanical engineering, hydraulic turbines, electronics, internal combustion engines, refrigeration, foundry work, machine tools, mining, civil and structural engineering, sanitary engineering, transport engineering. soil science, agricultural engineering, fertilisers, hotriculture, animal husbandry, dairy science, chemical technology, fuel technology, industrial microbiology, oil technology, leather technology, paper technology, textile technology, computers, literature, geography and history. This Section is particularly important because it lists the real resources we have created in the post-independence period: how our men and women have gathered knowledge in various fields and in languages foreign to the country. These constitute the real resources for development.

In order to make the Roster of practical use, the INSDOC has included a section on town-translator distribution so that in every town, a person comes to know of the translation facilities available. Delhi has probably the largest list of foreign language translators, among the towns and cities of India.

A useful section has been added at the end, giving what is called Indian Language Expertise: under each Indian language is listed a number of persons against whom certain foreign languages are indicated in brackets. The largest list is naturally under Hindi, going over nearly three printed pages, each of three closely printed columns. This is significant because a large volume of foreign technical literature has to be translated in the short period in Hindi. But the list under other languages is also substantial: Bengali goes over more than one printed page, Marathi more than half a page, Tamil nearly a page; practically all Indian languages are covered.

A serious error is the total absence of numbering, so that everywhere one has to count before one can make a numerical appraisal. The INSDOC will be well-advised to correct this error in the next edition; otherwise it is a very useful publication. Every institution in India should be in possession of a copy of this Roster. It is a folly not to have priced it.

Sharing the Gains

I am a florist, and my wife has a hairdressing business. We are satisfied that the new tax will add nearly one per cent to our overheads : and we are therefore increasing our charges by a shilling in the pound.

On Management of Plans, Projects and Personnel

DH BUTANI

In recent years there has been a significant change in the quality and output of management literature in India. Not long ago, it used to be borrowed stuff: not only the theory but even the incidents and situations were largely drawn from Anglo-Saxon life. Now one gets the feeling as though indigenous management literature has been born; and it looks a promising 'substantial' baby.

In fact, the quality of some of it is comparable, and in parts superior, to some of the material that has been coming to us from abroad in past decades. The reason for that probably is that under the exhilarating impact of what may be called the Development Decade—it is much more than that, for we have had more than 15 years of economic planning in this country—some of our veterans like HVR Iengar have been making their time-old experience available for what is known as Management Development in this country.

IT IS FASHIONABLE TO SAY THAT WE ARE living in critical times and that this is a critical year; and that the times were never so bad and that the deluge is going to be upon us. It is easy to be wise after the event and it is not a little difficult to contradict the prophets of doom; but when a man of the stature and experience of HVR Iengar tells us: "...I have enough faith in the vitality of our people to believe that it (leadership of a high order) will be forthcoming and that from out of the present confusion and sense of frustration, we will emerge on a plateau of high and sustained endeavour": these words do dissipate the gloom that surrounds us.

Continuing in the same vein, HVR Iengar added: "My optimism is due to two factors. The first is that, on the whole, our people, though a majority of them are unlettered, have shown a great deal of commonsense in the way in which they have voted. The second reason is that *historically we have again and again risen from chaos to great heights.* There is no reason why we should not do so again."

*Management of Plans** in which Sri

*It is really a matter of pride for us to record that this Book has been edited by our former colleague Dr. SPS Pruthi, now Professor of Economics at the Indian Institute of Management, Ahmedabad. It is really rare, not only in India but in any country that more than 50 per cent of the material is first rate. That Dr. Pruthi himself should have edited a Book of this quality and furnished an introductory chapter, giving certain very valuable statistics and references to French Indicative Planning and such like learned matters, is really a matter for congratulation. Of course, the young Pruthi's analysis is somewhat dark but that is a matter of age, and in any case sufficiently more than offset by the brave optimism and well-informed judgment of a number of contributors whose names adorn the Book.

Unfortunately the Book is wholly unnecessarily disfigured by a number of printing howlers which detract from the value of an otherwise excellent publication; and these howlers begin from the very first sentence in Dr. Pruthi's initial paper: "The prevailing atmosphere of uncertainty about the Fourth Plan and doubts about the institution of planning itself provide an awkard setting for retrospection and **pregnastication**." The underlined word is given here, as printed in the Book. Of course, there are a number of other howlers, quite enjoyable for those who have a saddistic liking for this rather devilish business.

The Book is worth buying, being priced rather cheaply at Rs. 10 for a volume of 208 pages of highly readable stuff.

Iengar's talk has been printed is **gem of a publication** brought out by the Ahmedabad Management Association. Five of the 9 pieces published in the Book—those by Dr. Vikram A Sarabhai, Sri Bagaram Tulpule, Prof. M.L. Dantwala, Dr. John P Lewis of US-AID and Sri HVR Iengar, to mention them in the order in which they have been published—are absolutely first-rate. Few of the pieces published in recent times could be compared to these, in point of profundity of analysis, constructive and sympathetic outlook and a deep regard for the public interest.

The rest of it is, of course, mediocre, if not quite puerile stuff, such as "...India serves as a warning and not an example to the rest of mankind (page 135)...our Government had taken adequate and sustained measures to ensure the decline and fall of the rupee (page 136) ...there are many socialist countries in the world but India is the only country where income tax and wealth tax can together amount to more than hundred per cent of the total income" (page 137)...how the rich then survive and prosper, the author does not stop to reflect on the *reductio ad absurdum:* "...Government's taxation policy destroys all cost-consciousness as it destroys ethics-consciousness (page 138)...The crushing burden of taxation is reflected on the stock exchange (page 138)...the Goverment's fiscal policies make it impossible for the nation to breathe (page 138)... it is easier to increase the national product than to change the national character (page 143)...*if any Government is foolish enough to implement the Fourth Plan, we shall have to write on the gates of our economy the famous words of the Italian Poet: 'Abandon hope, all ye who enter here'" (page 139).*

As against this type of stuff, it is quite an enjoyable experience to find in the same Book, a lot of sense and a number of creative ideas put forward by men in highly responsible positions. In a short but very sweet analysis, with which he inaugurated these series of talks now published by the Ahmedabad Management Association, Dr. Vikram A Sarabhai, Chairman of the Atomic Energy Commission—though he too was critical of the Planning Commission in its management of the plans—put forward quite a number of sound ideas. The very first opening sentence contains the key to the solution of the problem: "Today in our country there is need for social and political inputs in addition to physical and financial, for achieving a high rate of growth." This reminds me, when Gunnar Myrdal was here quite some time back, he pointed out that the political base for economic planning was weak and he put forward the idea of rolling plan in which every year the plan is reviewed and revitalised in the context of experience and expectations. Vikram Sarabhai puts forward the same plea: "There is today the growing need for framing what is called a rolling plan, which takes account of projections five years in advance but revises them every year."

In his criticism of Planning and the Planning Commission, Dr. Sarabhai has put his finger on exactly the right spot: "...the National Planning Committee of the pre-independence days which had revolutionary thinkers has been transferred into an *instrument of Government* with the net result that it is today *a sanctioning authority without the responsibility of delivering anything except giving a plan book* ...planning is unrealistic when defence, fiscal policy and foreign affairs are excluded from the purview of the groups which are involved in the planning process". (Italics ours).

Vikram Sarabhai has thus given us the correct diagnosis as to why the management of plans has gone wrong. Foreign affairs—the way we manage them—have an impact on the resources available for economic development, and yet they have been dealt with in a manner as if either it was not so or we did not care. The annual outlay on defence during the last three/four years has risen from Rs. 300 crores to nearly Rs. 1000

crores, and yet the planners believe that the same or even a larger quantum of resources could be made available for development. This is exactly why things have gone wrong; and the management of the plans has gone awry.

Rightly Vikram Sarabhai argues that we give up the "all this and heaven too" approach. Avoiding all wishful thinking, we should "prepare a series of choices on which political decision-making can be done. It is necessary to state what one wants, as well as what one should do without.... Planning currently amounts to putting together requests from a number of groups based on wishful thinking....Wishful thinking, guestimates and hunches should yield place to detailed working and a scientific working of basic data of inputs and outputs. Good intentions should be translated into an operational plan..."

Dr. Sarabhai has made two other points which are worth mentioning:

1. While the building of the infra-structure facilities may be left to the public sector, in other spheres competition may be encouraged between public and private sectors, and then follows what very much needed to be said: "Difference in nature of ownership should not prejudice the basic proposition that *the public sector could be at least as efficient as the private sector.**" (Italics ours).

2. The second remark is really profound and shows correctly what exactly is wrong with the Indian economy: "Developing countries will not catch up with international markets unless the concept of the cost structure is properly understood. There is need for a technological revolution for minimising the cost of essentials like power which is generated in the USA in modern plants at two paise per kW hour, whereas in India it costs 4½ to 5 paise."

Another piece, though obviously different in perspective, that is worth reading in the Book is Labour Policy and National Plans by Bagaram Tulpule, Secretary of the Mill Mazdoor Sabha, Bombay. The modesty and accuracy with which Bagaram Tulpule has marshalled facts, speak highly of the intellectual calibre of the labour leadership in this country. Regarding employment, quoting facts and figures, he says: "Employment in industry and other sectors has, no doubt, increased substantially in absolute terms. However, unemployment has, increased faster." In fact, unemployment increased from 2.5 million at the end of the First Plan to 9 or 10 million at the end of the Third Plan.

It would be difficult to challenge either the analysis or the very constructive suggestions put forward by Bagaram Tulpule: "...The technological level of new factories and industries has been fairly advanced and hence their employment potential has not been high. In some industries like jute, total employment has actually fallen due to modernisation."

What then is the way out: "The dimensions of the problem are such that they call for avenues of employment on a mass scale. The various branches of the construction industry, especially housing, road-building, etc., and large and small irrigation works do offer such avenues. Further, they are also urgently needed for economic development itself." Tulpule follows this up by a series of figures, showing how in vital sectors, sanctioned money has remained unspent. Rs. 1000 million was earmarked for rural works programme in the Third plan. Only Rs. 190 million was spent. Out of Rs. 3875 million earmarked for housing—largely industrial housing—sanctioned during the first three plans, only Rs. 640 million was spent up to March 1965, and the number of

* Significantly, Dr. Sarabhai added: "In the Atomic Energy Commission I will try to demonstrate this thesis."

houses built for mining and plantation workers were negligible both in relation to targets as well as needs."

As an economist who has been in the line for over three decades, I would unhesitatingly support Tulpule's suggestion for a reorientation of the planning pattern in this country: "...Basically, the question needs to be examined whether the whole pattern of investment in the plans does not have to keep maximising employment as one of the major ends to be achieved. This is not being done :" and if it is done and the whole policy is properly structured and coordinated with economic, fiscal and monetary policies, most of the social and economic problems from which this overcrowded country suffers would be nearer solution, for the mass of the people must have work to do: that is the prime requisite of a large-scale society. The whole philosophy and practice of management must be attuned to finding productive work for the entire employable population. In fact, the problem cannot wait to be solved, plan by plan; and it need not wait.

Again with regard to thc creation of training facilities, Tulpule's approach is at once sensible and reasonable: "*..skilled labour is already one of the limiting factors in industrial growth.* Even in an advanced country like Britain the need for skilled labour has led to training schemes like those at Aintree where fully trained tradesmen are turned out in six months. *No such sense of urgency is to be found in official thinking* and action in our country."

Tulpule's historical account of real and money wages in this country is both concise and precise, and his analysis is unobjectionable. "There are virtually no traditions of collective bargaining in the public sector... Different Ministries in the Union Government and different States seem to follow different industrial relations policies and well-meaning but ineffective voluntary Codes are expected to fill up the deficiencies of the Statutes." His suggestion regarding "limited, time-bound, quantitative objectives to be reached, followed by purposeful efforts at the industry level", deserves respectful attention.

On planning, few have written more precisely and more soberly: "*The challenge of planning lies in trying to achieve something bigger and better than might be expected to happen without planning*, for, even in the absence of a plan all progress does not necessarily come to a stop. Planning, therefore, demands a purposeful pursuit of clearly defined and internally consistent objectives and a proper order of priorities since all the things that need to be done cannot be done at the same time....It might be incorrect to put down failures to bad management of plans alone. The question whether these were not the consequence of the basic attitude of placing too much emphasis on physical targets and not enough on social objectives, is of fundamental importance."

There has been in recent months a polarization in respect of social objectives; and as soon as the political atmosphere clears up, we may have Tulpule's type of planning based on social objectives: whether they would be acceptable to him and men of his way of thinking, it would be difficult to say.

In this context, we may draw attention to an article on the Political Role of Labour published elsewhere in this issue of the Journal, based on Bruce Millen's substantial research in the line. It is Bruce Millen's very considered advice to the US Government that they should put a premium in their aid programmes on socialist orientation of policy in developing countries, as the only realistic antidote to the possible emergence of totalitarian forces. Internally, probably, we are veering round to the socialist objective; and if managements in India—whether in the public or in the private sector—accept the socialist philosophy in the broad egalitarian sense with which it was originally designed by the father of socialism in this country—the late Jawaharlal Nehru—

the country might soon begin to move out of the current economic malaise to wider horizons of social well-being.

From many points of view, what Professor Dantwala has said on the Agricultural Sector and Implementation of Plans, is the best if not the sweetest, ending, as it does, on a philosophical note: "What is true of ideas is also true on the more mundane level of Plans. Even so, some societies are good at abstract thinking; others at doing things. As a nation, perhaps we belong to the former category."

Of course, this is not the whole of Professor Dantwala's story. For his factual attack on the management of plans, particularly in the agricultural sector, is devastating. "...Adding the expected increase in irrigation potential under each of the three Five-Year Plans, we get a total of something like 37 million acres. If the expectations of the last year of the Third Plan materialise, the actual additional irrigated area would be not more than 13.8 million gross acres. Against a shortfall of 20 per cent in financial outlay, the shortfall in physical achievement is likely to exceed 60 per cent."

Again in a subsequent paragraph, Prof. Dantwala rubs in the point: "...the point which needs emphasis is that in each of the three plans, even the potential generated was awfully smaller than that postulated in the plan, though the bulk of the planned expenditure was incurred as provided. It may be conceded that the cost of the material and labour has been rising sharply, but the gap between achievement and the plan estimates is so large that it creates apprehension about considerable inefficiency being associated with the formulation and the execution of irrigation projects.".

Actually the explanation of what has happened is simple. What the Planning Commission has done is simply to add up the potential of the various irrigation projects as submitted by the PWDs of the State Governments, who spent the money to the hilt, without being under any compulsion to create the corresponding potential. It is just a continuation of the practices that used to be regularly followed in the British period.

Subsequently, the Research Programmes Committee of the Planning Commission sponsored several research projects to assess the economics of irrigation; and a report has been published: "...all this knowledge about inadequacies in the programme does not seem to result in any concrete improvement in planning." (page 99).

At some considerable length Dantwala carefully analyses the various causes of failure: the quality of political leadership, the quality of policies, of the administrative machinery, and above all that of the farmer supposed to be ignorant, tradition-bound, lethargic, etc. etc. Then the Professor takes up a case: the one relating to the establishment of a seed farm in Kozhikode District. This took 20 months because of the various requirements of law and audit. Prof. Dantwala's conclusion is very comforting but may not be acceptable: "I have reason to believe that most men in charge of responsible work are sincere and mean business, but they are often frustrated by the requirements of law, procedure, audit and accounting."

While there may be disagreement with Prof. Dantwala's appraisal of official integrity and enterprise, his analysis of the farmer's response corresponds to facts. "Millions of farmers in India are, no doubt, ignorant and tradition-bound; but there is not the slightest evidence to suggest that they would not respond to policy or programme which is manifestly in their self-interest. Very often, it has been found that the extension agency itself lacked the competence to advise the farmers, and even when their advice was sound, as in the case of the improved practices, the ancilliary help in the form of credit and required inputs was simply not available."

Prof. Dantwala ends his analysis with a beautiful philosophical note, remarkable for its sweetness and wisdom: "The translation of an idea first into suitable institutions and then into action is always a difficult process. We discover this every day in our small world, but when the canvas extends to the entire nation, the hiatus between the idea and the outcome is disturbingly wide. To an extent, this is inevitable. Even when the idea is intrinsically sound, the real world is much more complex than even the most practical men can comprehend. Many imponderables enter when implementation of the idea is attempted." This academic approach, however, would lead us nowhere: we have had difficulties: the British left us rather badly; we have had trade unions and we have no colonies and concentration camps; nevertheless our agricultural output has grown on the average by 3.3 per cent per year. We must of course do very much better and let all of us make our best contribution. Thus we are in the widerness again and the academician leads us nowhere, unless it be to Sankara's *Advaita Vedanta.*

From the point of view of pure theory, the contribution of Dr. John P. Lewis, Minister-Director of US-AID in New Delhi, is in the classic tradition. Without mentioning names, Dr. Lewis, an old-time Professor of Economics, has given us the quintessence of Adam Smith, Ricardo, Marshall, Pigou and Keynes. We are treated to a healthy and brilliant analysis of the market function; how an incentive system is a far more satisfactory form of general economic management than is a command system: how the market system is an enormously helpful device for organising and actuating incentives; and we are told, what is certainly correct, that after World War II there has been almost a rediscovery of the market as a socially useful instrument: "It has swept through not only Western Europe and the United States but also Japan, many of the developing countries of Asia such as Taiwan, the Philippines, Hong Kong, and more recently South Korea. Several years ago, it began to make its mark in Pakistan. And, most strikingly, it has now spread extensively to the socialist countries of eastern Europe and the Soviet Union and the hint is clear that Socialist India ought to manage its economy very largely through the market machanism, if it is to qualify for Uncle Sam's patronage, for that would naturally depend on how well we manage our affairs,

And then Professor Lewis retails the many advantages that we would gain from the employment of the market machanism. It has inherent democratic advantage because it enlarges the territory of free choice. It has an inherent administrative economy; an inherent moral economy (Adam Smith's invisible hand of God). The market has self-correcting, plan-correcting properties; it can quicken the economy's whole operational performance.

In the context, Prof. Lewis advises that the Government, after having articulated the general economic goals, set its fiscal and monetary policies in support of the desired growth rate and created an infra-structure of facilities (roads, railways, presumably power); and then simply should free the market letting the unfettered profit-maximising decision making of individual enterprises (whether publicly or privately owned) provide the actual investment and other implementation of the expansion programme.

Not long ago, Prof. Ludwig Erhard published an exposition of how, when he was in charge of economic affairs in postwar Germany, he brought about an economic miracle which resulted in one of the highest growth rates in world history: what Prof. Lewis is saying here is exactly what Prof. Erhard said in praise of a competitive economy; yet one wonders how in an economy where the aggregate demand for practically anything from ordinary foodgrains to cars and refrigerators far exceeds the aggregate supply capacities, and this aggregate demand is going to be far in excess of aggregate supply for any foreseeable

time; one wonders how the market mechanism can possibly function according to the classical pattern.

To some extent and in a different context, John Maynard Keynes did say that the classical pattern of the market mechanism would come into its own, in conditions of full employment; that was against the background of depression, unemployment, fall in incomes, and general deficiency in demand. If we have a full employment policy, without a fairly rigid restraint on demand, it would just blow up the economy through a rocketting inflation, such as characterised China before the Communists took over Shangai in 1948. We surely do not desire that to happen in this country. So we must proceed in a somewhat sober way, considering all particular circumstances and needs, if we are not to lose our grip on affairs.

Hence for really very practical reasons, apart from ideology, no Government in India, with its knowledge of the realities of the market place, the limitations on resource mobilisation, would take Prof. Lewis's practical advice which he sums up in the following words: "As a practical matter, the proposition—when in doubt, free up, and trust, the market—makes sense."

Prof. Lewis, of course, has been truly academic in the sense that he has followed up the analysis, by emphasising the limitations of the market mechanism and how it can be improved and properly organised to serve the purposes of the plan; and students of economics could profit greatly by considering the many good points that he has made at some considerable length. In the context one really does not understand, when he utters a political slogan: "A pox on doctrine...let's get on with the job." True, we all want to get on with the job but let us not mistake the doctrine, whether expounded by Prof. Lewis or anybody else. The theory is important; in fact, we have lost a good deal because we have not realised the very practical importance of theory provided it is a correct theory and the correctness of a theory is simply tested by its correspondence with or divergence from the facts of a given situation.

One of the facts which Prof. Lewis has assumed away is, as pointed out earlier, the continuing disparity between aggregate demand and aggregate supply; and that quite shatters the market theory in the sense that we cannot rely on the market mechanism for development, though we may and we shall have markets in various spheres and over fairly large areas, but *we cannot let the market manage our economy.*

Incidentally, Prof. Lewis has taken the opportunity of complimenting the Perspective Planning Division of the Planning Commission on the production of the document entitled *Materials and Financial Balances*, indicating for the end years of the Fourth and the Fifth Plans a fairly specific set of consumption and other end use of requirements, of export and import requirements, and of the productive capacities for producing intermediate goods and services needed to make good this bill of final demand: in true American style, Prof. Lewis applauds the document: "This is a quite remarkable document, it may well be the most explicit detailed exposition of a national planning *Tableau any Government anywhere has yet issued.*" (Italics ours).

Of course, in a later paragraph, when Prof. Lewis is at the height of his analysis of the market mechanism, he utters what may be called a funeral oration of the work of the Perspective Division. "...the input-output targets for a future year contained in a document like 'Materials and Financial Balances' are no more than a *set of conditioned forecasts.* If the desired resources picture can indeed be made to materialise, then these targets are predictions of the particular capacities, outputs, and inter-industry flows the market will choose to develop. But if the market in fact throws up a different inter-industry array of steel, cement,

fertilisers, wheat, cotton, jute export, and other numbers, it will be the forecast, not the market, that is wrong."

As an essay in economics, Prof. Lewis's piece is unbeatable in its excellence of analysis and profundity of judgment; and there is a lot to be said for it, if we ignore the underlying political philosophy. It is a very considered opinion of this author, who has spent more than three decades in this line of Economic Analysis, that we should and can develop this country by socialist methods, and we can thus attain the highest practicable rate of growth; but if for any reason socialism is not a practical proposition, then positively capitalist methods should be fully and honestly employed to mobilise the resources of this country, for there is no greater disaster that can befall us than leaving the country undeveloped. If capitalist development is the only practicable alternative, we should go in for it, and the earlier the better. If we do so, what Prof. Lewis has written must become our Bible; and it would be a good one at that.

Apart from certain statistical tables and appendices, the Book ends with HVR Iengar's summing up the whole debate on the management of plans. It is a mine of wisdom, extremely well-documented from readings both at home and abroad, drawing upon his whole experience for ironing out a policy in the public interest: above all, it sounds a note of optimism, throwing out a line of life, as it were, against the dark and murky background painted by other writers and analysts. To say the least, it is an elevating piece both in its depth of analysis as also representing the grandeur of an ethos, not to be cowed down by the difficulties of the times, however cruel and hard they may be. It is refreshing to hear from a distinguished civil servant who has spent decades of his life in the service of his country, ending with the Governorship of the Reserve Bank and Chairmanship of two of the largest industrial complexes in this country: "...*I do think that we are today on the eve of a breakthrough*, which will enable us in a few years' time and not many years at that—to manufacture the bulk of the machinery and the machine tools, heavy and light, that we require (page 151)" Of course, there have been difficulties and "...There may be legitimate criticism about some aspects of our economic growth, but there is no reason to feel defensive and pessimistic about what we have actually achieved. This pessimism and the disorder and violence which we have seen recently have arisen to a large extent from the fact that the country's economy has been passing through a bad phase as a result of an unusual combination of events—two very bad droughts, the slowing down of foreign aid after the Indo-Pakistan war, and the mounting pressure caused by a severe escalation of Defence expenditure."

What is important, HVR Iengar is not talking in the air: his whole thesis is well documented from the time that Dr. John Matthai, the Finance Minister for the Government of India. resigned on the issue of the establishment of the Planning Commission. Dr. Matthai then said: "...There are at present on the shelves of the various Ministries of Government, plans costing nearly 3000 crores which have been held up for lack of finance, material and technical personnel. In my opinion, what is required at present is first to draw up a strict order of priority for the existing plans."

Surely then Dr. Matthai knew the very essence of planning and wanted that there should be real planning instead of the patchwork we subsequently had.

Probably in this context, we might as well recall an important sentence in Dr. Matthai's resignation letter to the Prime Minister: "...Government breaks down at the point of contact with the people." Maybe that a major cause why the management of plans has gone wrong may be attributable to this diagnosis of the late Dr. John Matthai.

Interestingly, without probably knowing it, HVR Iengar gave a version as to what has happened in the world, so different from the one presented by Dr. Lewis about the power of the market mechanism spreading throughout the world, including the socialist countries. On the other hand, HVR Iengar said that the idea of a planned economy for making the most effective use of limited resources, apart from being "sound and necessary, is percolating even to some of the citadels of the free enterprises in the West."

Though HVR Iengar has quoted the last President's Independence Day talk and the London Times' New Delhi correspondent on certain adverse developments, his conclusion is generally optimistic : "...we have made a great deal of economic development without destroying the dignity and liberty of the individual (page 146)...I take the view that on the whole our Second and Third Five Year Plans were well-conceived and that they were sound both in the balancing of their different sectors and also in their total scale (page 155)...there is, first, the, quantitative improvement in industrial production which has gone up since 1951 by some 250 per cent, then there is the more important structural improvement — a change in the type of things we are making. We are today producing machinery and machine tools which were not dreamt of in 1951...In agriculture it is fashionable for us to say that we have failed. Considering the enormous complexity of effecting changes through millions of peasants—most of them illiterate—the simultaneous increase in the production of foodgrains, of sugarcane, of oilseeds, of jute and of cotton is a real achievement."

By and large , HVR Iengar's analysis is that our difficulties are really due to an enormous increase in population, an increase in defence expenditure and, at the top of it, continuous drought in large areas for two years; and things have naturally become difficult because of the inability of Administration to cope up with the resulting magnitude of problems—a very clear and sound judgment. When these obvious explanations are available, one wonders why there is an almost frantic search for scapegoats and we are all inclined to put the blame on everybody except ourselves.

HVR Iengar's analysis of the political system is profound and has an almost Aristotelian tinge: it was Aristotle who said that we must have in the first instance a sound polity, for a sound economy can only function within the framework of a sound polity. HVR Iengar's analysis of the political system and the administrative machinery through which it works and his quoting the former President Radhakrishnan and the London Times' Correspondent, should be understood in this light. Dr. Radhakrishnan is quoted as having said, *inter alia*: "...even after making allowance for all the difficulties of the situation, we cannot forgive widespread incompetence and the gross mismanagement of our resources."

Then HVR Ienger goes on to analyse the sensational despatches sent by its New Delhi correspondent to the London Times, ending with the dictum: "...In such circumstances, something will have to give, and it seems that the system will go first": he meant that democracy in India will collapse. To this HVR Iengar gives a cogent, yet unequivocal answer: "...it is possible to catalogue a string of weaknesses and draw pessimistic conclusions from them and, in the process, ignore the elements in our society which provide some degree of strength and cohesion and also the very substantial nature of progress that, under very difficult circumstances, has been achieved over the last few years. I am convinced that in spite of all the ills that are given great publicity, there is a basic sense of unity and purpose in the country. ...although the electorate has been largely illiterate, it has shown, during the several elections that have taken place, a remarkable

degree of commonsense in the manner in which it has voted. *India is much sounder and stronger than its politicians*....India has again and again in her history shown a capacity to rise up from travail and disorder and achieve great progress."

In fact, there is reasonable justification according to HVR Iengar for a measure of confidence in the possibilities of the Indian economy; and this is substantiated by the following real story related by him in the course of his talk: "...A young European news correspondent had recently spent about eighteen months in mainland China, followed by a long stay in India. The correspondent's impression was that the record of the two nations in providing clothing, food and housing for their people was roughly comparable, but there were two main differences. In India he felt free to question government officials and political leaders. He asked pointed questions and received frank answers. In China such freedom was unavailable. On the other hand, he was disturbed by the contrast between what he described as the fervent doctrine everywhere in China and the spirit of defeatism which he often found in India. 'Why', he asked, 'does India, which has progressed at least as much as China, not take great pride in its accomplishments? Why is China so confident? Why is India so insecure?' This was some time before the recent disorder in China...It is not easy to ascertain what is actually happening in that country; all that one can say is that cataclysmic political changes appear to be taking place. But whatever the outcome of these changes, there is little doubt that we, in India, are daily goading ourselves into moods of deeper and deeper frustration and pessimism. I think this is a serious weakness in our mental make-up. In this connection I recall a conversation I had with a member of a Chinese cultural delegation several years ago, when our relations with mainland China were friendly. He had just returned to Delhi from Bhakra Nangal. He said to me: 'I just do not understand you people. Here is a first class job of work done by your own engineers. I don't think we have in China a group of men who could do a similar job. But I have not heard a word of praise for your engineers. There was a debate the other day in the Punjab legislature and it just consisted of querulous comments that some people had made money illegitimately. This may be so, but why do you go on harping about this and completely forget that a magnificent job has been done which will bring untold prosperity to your people. If we had done a similar job in China, we would have set apart a day every year and called it the Bhakra Nangal Day; we would have distributed millions of paper flags amongst the school children and proclaimed the prowess of our engineers through the radio. The whole country would have been proud. But here you are bemoaning the fact that somebody has swallowed a little money!" There is certainly food for thought here. He is rightly of the opinion that things would improve considerably, if men in authority religiously attended to "the grinding and exhausting task of seeing that the official machinery performed its task with competence and insight."

Though in the present state of anger and frustration, many may not agree with the author but there is reason to believe that due to greater public vigilance and awareness and also because of the considerable experience gained during the last 15 years, the quality of public services is likely to improve. This is not merely a matter of faith but also of historical experience because public services even in the highly developed democracies of the United kingdom and the United States were at one time highly corrupt, particularly during the early days of the Industrial Revolution. We have passed through the same experience, with a radical transformation in the functions of Government and almost revolutionary changes in the very structure of the economy, and the corresponding monetary and financial turnover. In any

society, changes of this magnitude were bound to exercise an unbalancing effect, both on the integrity and the efficiency of the public services but once we have passed over the hump, there is reason to believe that we shall attain a new moral equilibrium in tune with the requirements of a large-scale economy.

The problem is really with regard to the management of private sector; and if we proceed pragmatically rather than ideologically, the way to tackle the problem in the private sector will become clear. *Obviously the main function of Government is to so organise the economy that the people have food and that the people have work to do.* These are very major jobs. If we do not perform them adequately, we shall, in fact, be playing the game of our pessimistic detractors. If we tackle these problems with courage and wisdom, most of the other problems that plague us will be much easier of solution than they are at the moment. Very obviously, the food problem can be solved by making agriculture, left and right, an incentive system for those who work on the soil, as also for those who furnish them the necessary inputs in terms of improved seeds, fertilizers, agricultural equipment, etc, etc.

As regards employment, the public sector furnishes employment to about 11 million persons. Assuming a family of five, including the bread winner, this would sustain a population of 55 million. The rest of the people—450-million—have to depend for their livelihood on the activities of what we call the private sector including large-scale and small industry, rural industry, commerce, transport, banking and the last but not the least, agriculture and connected occupations. *Thus the country has a vital stake in the prosperity and productivity of the Private Sector.* For purposes of policy, this means that the management of private industry must receive a good deal of attention. We must see to it that the Private Sector is helped in every possible way, and activated in areas, where expansion of output and employment are sought to be achieved. We want the Private Sector to prosper and multiply in an economy of abundance. Profiteering on scarcities is a different business which no good government will allow, and it is no kind of productivity either.

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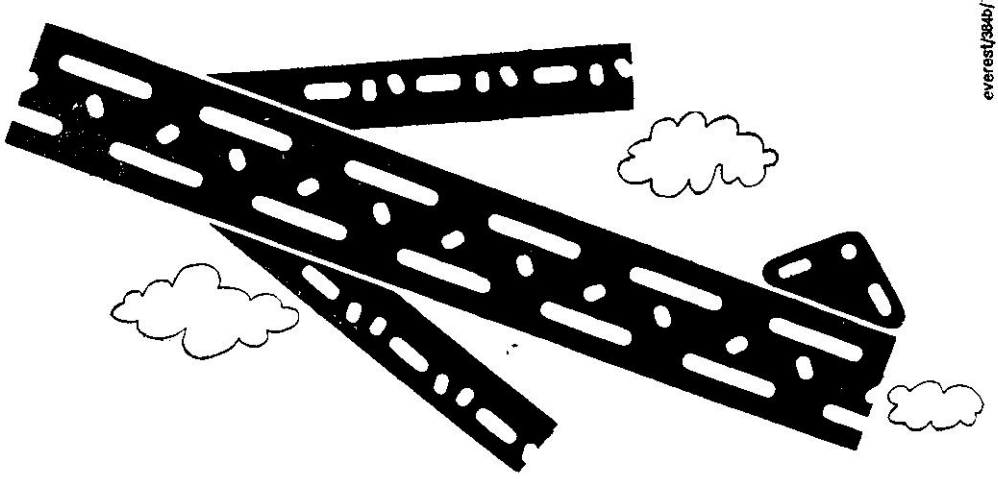

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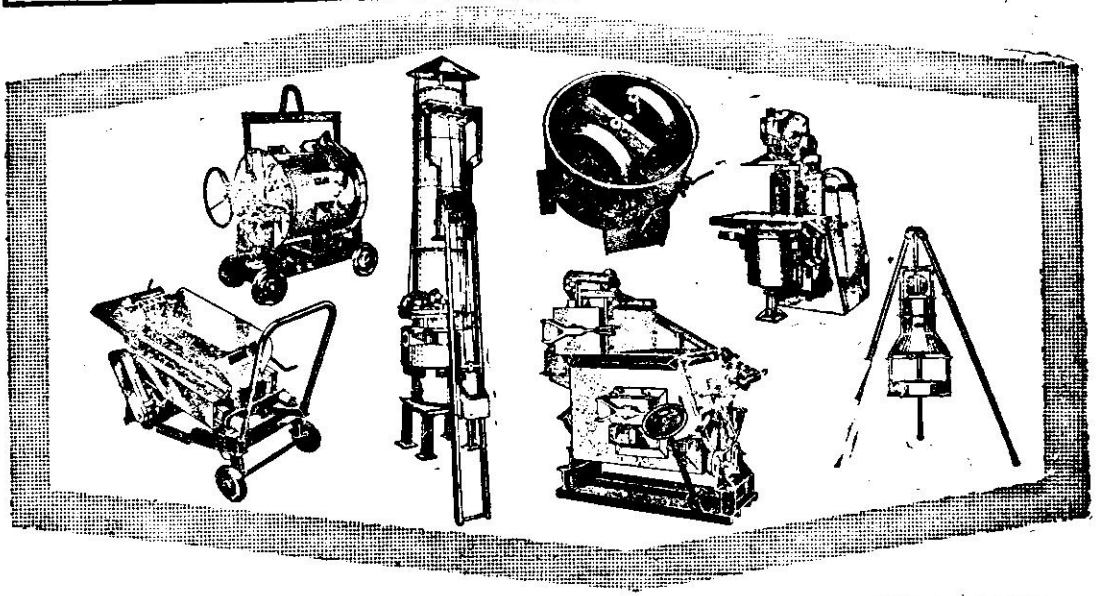

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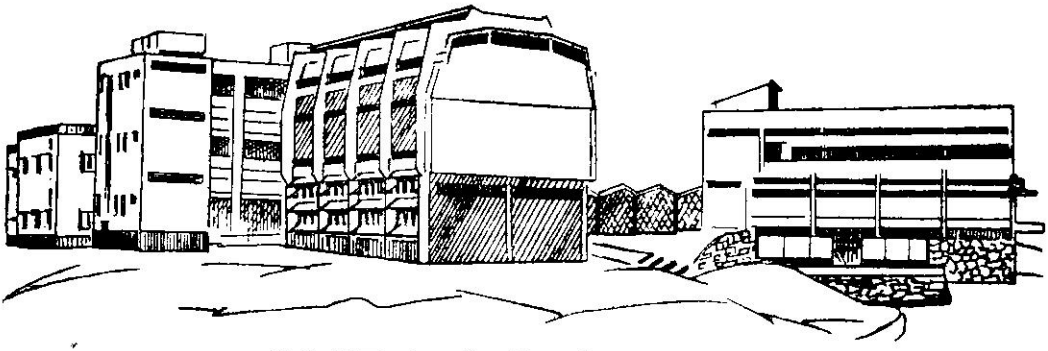

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