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PRODUCTIVITY

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Photographs and other illustrations are welcome, but should be restricted to a minimum. For each one, the appropriate place of insertion in the text should be indicated.

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PRODUCTIVITY

NATIONAL PRODUCTIVITY COUNCIL JOURNAL

Beyond IPY

WITH THIS Souvenir Volume, the IPY comes to a close. There will be criticism about what we have achieved, what we could have done and we did not do, etc. To these questions, the National Productivity Council, in all conscience, is bound to address itself in the Evaluation that will follow.

We who are insiders are, naturally, deeply concerned about the future: we have certainly created productivity consciousness during the many years that NPC has been functioning, and very particularly during IPY-1966. By and large IPY has been a publicity programme drawing the attention of as large a body of citizenry as possible to the imperative need for productivity, both in the national interest, as also for personal self-advancement. To that end, we organised a number of national seminars in a large variety of fields, including Agricultural Productivity, Fuel Efficiency, and Building Construction and intensified the normal training programmes. We offered PSIS on an ever larger scale, expanded the Fuel Efficiency Service, held a number of conferences about Agricultural Productivity to bring nearer to us the men and officers with whose cooperation alone we could make ourselves useful in the field of agriculture.

Considering the resources at our disposal in relation to the magnitude of the tasks to be accomplished, and against the background of difficulties of an

extraordinary character—the worst drought in history, the hot war with Pakistan, the stoppage of foreign aid, the continuing crisis in the balance of payments, devaluation, etc.—the achievements have not been inconsiderable. The very fact that there is a demand from many quarters for what is called Productivity in Depth is an indication both of the success of IPY as a publicity programme and also as a guideline as to what we may do in the future.

It should, however, be clear to us that no longer will people be satisfied with slogans alone. We have been operating in the field of productivity since the beginning of 1958. By February 1967 we will have completed nine years of active service—nearly a decade. We can now confidently settle down to quiet and solid work at the ground level, for the case for the continuance and strengthening of the NPC has, in fact, become somewhat stronger; and there is no real cause for pessimism. We have trained productivity experts by the thousands, and brought new productivity techniques to industries. We have produced a large volume of literature on subjects of which very little was known a decade ago. Above all, we have created a demand for productivity from the industries, from the Government, even from agriculture. In fact, strident voices are now heard asking us what this productivity means; what its implications are; and what we can do to have more and more of productivity!

It is thus apparent that there does exist a substantial base for expanded activities in the field of productivity. The very fact that there is an extraordinary turnover of productivity personnel within the NPC, and persistent demand from the Local Productivity Councils for the employment of productivity personnel; that the market for management consultants, who, in the first instance, felt threatened by the coming into being of the National Productivity Council and the expansion of its activities, has, in fact, expanded beyond measure—all these facts show that if we are in a position to offer devoted service, we shall find an almost infinite market for what we have to offer; and the country and the Government will be prepared to pay for our service on an increasingly remunerative scale.

Of course, we must know our limitations. In inaugurating the Productivity Movement some years ago, Lord Netherthorpe, then Chairman of the British Productivity Council, characterised the NPY as a *blitzkrieg* on the public conscience. For all the reasons that we can think of, we need such a *blitzkrieg*. But it is obviously beyond the purview of NPC to bring it about; and it is always good for an organisation to know what it can do and what it cannot.

Britain is today organising what is called a Prices and Incomes Policy*, and legislation has been enacted to enforce such a policy, primarily in the interest of its balance of payments, and, secondarily, to consolidate the achievements of the

*Also, from October of this year, they have begun to organise what they call a Quality & Reliability Year.

post-war period, to suck out the inflation from within the economy, and to keep it moving forward on an even keel. Incidentally, but significantly, these policies have a bearing on what we call Sharing the Gains of Productivity.

We ourselves need economic policies of this character and magnitude if we are to achieve something significant in the field of productivity. We have to think out these policies, their practicability in this country, what can be done to prepare the ground for them, etc. We have, however, to confess that though we are vitally concerned, these matters are beyond the purview of NPC. In Japan, there is a close intimacy between the Japan Productivity Centre and the Ministries concerned with economic policy. Here we have had little of such liaison*. In fact, the imperatives of productivity have had very little impact on the content of economic policy in India, though productivity does find a mention in the reports of the Planning Commission, as one among the many thousands of things to which attention should be paid in the public interest. The question then arises: what does NPC do to have an impact on policy?

Taking for example the crucial matter of Sharing the Gains of Productivity, it is essentially a matter of Government policy. The guidelines, of course, are given in the Directive Principles of State Policy. These Directive Principles constitute the essential framework of social policy within which

*The fact that the Secretary of the Ministry of Industry, the distinguished civilian, Mr NN Wanchoo, has become the Chairman of NPC, does establish a liaison with Government at the policy-making level.

5 Years Ago

... Experienced industrialists, who have gone abroad in search of modern machines, up-to-date techniques, and top technicians, have come to almost this unanimous conclusion that the explanation of the high industrial productivity of developed economies lies in the teamwork which they are able to organize, in their attitudes of mutual helpfulness and tolerance. It is this **Industrial Culture** of mutual adjustments and compromises, of the give and take of life, that underdeveloped economies must evolve, if they are to attain those levels of productivity associated with modern industrial technology...

Essentially, personnel management, like statesmanship, is the art of the practical...and human relations techniques will not grow from foreign seed...Even the powerful Chancellor, Bismark, who initiated the industrial development of Germany, came at last to the conclusion that force can have little place in the management of men: "You can do everything with bayonets except sit upon them..." No longer are men satisfied with bread alone. In a significant piece of advice to leaders of Soviet thought, Lenin said: "...After people get bread, they begin to demand poetry..."

From **PRODUCTIVITY**

Vol. II, No. 6

alone a really productive economy becomes a practical proposition. The Constitution directs the State to adopt policies to secure the following ends: "that the citizens... have the right to an adequate means of livelihood...that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment... The State shall make provision for securing just and humane conditions of work and for material relief... The State shall endeavour to provide by suitable legislation or economic organisation or in any other way, to all workers, agricultural, industrial or otherwise, work, a living wage, conditions of work ensuring a decent standard of life, and full enjoyment of leisure and social and cultural opportunities..."

Basically these Directive Principles determine what we call Sharing the Gains of Productivity. But it is difficult for the general mass of the people to understand how far these principles have in fact operated; and we in NPC have no answer. But if we desire to motivate the people on the shopfloor, they have certainly to be assured of some reasonable share in the gains of productivity, before we can move them to action.

Unless such a policy becomes clear, NPC will be acting under a great handicap. Of course, NPC must continue to draw labour more and more into its productivity programmes through language publications on a mass scale, through publicising case studies, demonstrating the massive benefits to labour of enhanced productivity—through these and other means NPC must continue to honour its acknowledged obligation to identify productivity with the welfare of labour.

The most pressing problem in India is the need to achieve a rapid expansion of food production. NPC cannot consider its work complete, unless it did something to promote the productivity of India's major industry, viz., agriculture. In fact we would be failing in our duty if we did not join the imperative national task of achieving a major breakthrough in the field of agriculture, particularly because we have substantial experience in the application of productivity techniques in the field of industry.

It is obvious that, in the agricultural sector, our hopes will be realised only if productivity becomes a mass movement, covering every aspect of the life of the rural people, numbering nearly 400 million. We must, therefore, take steps, primarily through the Community Development and Extension Services, to help in creating and spreading productivity consciousness among the farming community, as we have done for industry, through appreciation courses conducted in local languages, through work study organised on medium-size farms, through publication of special productivity studies of materials handling on farms and in transit to processing industries etc.

If we are able to achieve this much, it would be a programme sufficient for the National Productivity Council at least for 1967, if not also for 1968.

Productivity & Prosperity

D SANJIVAYYA

Minister of Industry, Govt. of India

and

President, National Productivity Council

PRODUCTIVITY is a fundamental pre-requisite to rapid economic development through the effective and optimum utilisation of the available resources. In a sense it is the true harbinger of a nation's progress and prosperity.

Inasmuch as productivity means and implies generating more goods and services of better quality and at less cost, it holds the master key to the acceleration of the processes leading to India's economic resurgence.

The contribution of the National Productivity Council in introducing productivity to the various areas of human endeavour in India ensures for the NPC the pride of place in India's relentless march towards higher productivity.

The tremendous impact of the nation-wide productivity drive during India Productivity Year-1966 bears ample testimony to the efficacy of productivity as a safe means to prosperity.

Every one of us must, therefore, strive our very best to better our performance, thereby helping the nation to attain higher levels of productivity in the shortest possible time.

Focussing attention on the relevance and imperative need of productivity was the main objective of the IPY. The productivity effort must necessarily continue in the years to come even though India Productivity Year would officially close on Dec. 31, 1966.

Attitude of Labour Towards Productivity

JAGJIVAN RAM

Minister for Labour, Govt. of India

IN VIEW of the IPY celebrations this year, productivity acquires a very special significance in respect of the activities undertaken by us not only this year, but also in the future. In the context of Devaluation, productivity has assumed added importance, because unless all sections of society make their most productive contribution to the creation of wealth, we shall experience difficulties in meeting the situation that we have to face.

We must, however, view the position in the proper historical perspective. In the early stages of society, there was hardly any capital. Broadly, there were two factors of production, land and labour, which combined to produce the wealth that the society at that time needed. As society developed, the production of wealth deve-

loped; and wealth was nothing but capitalised labour, labour being the basic factor of production.

While this is fundamental, the quantity and quality of wealth produced by labour depends upon its attitude, and this, in turn, is determined by the rewards and incentives, which society offers to labour.

In simple terms, this is broadly the explanation of the working of a modern economic society. Of course, in recent times the apparatus of production has grown more and more complex, and we have developed huge organisations which we call the corporate sector.

Consequent on these developments, there had been some complications in the social process. Labour hardly gets the

satisfaction of knowing its own individual achievement. So long as the machinery of production was not complex, the individual artisan took pride in the product that was the result of his labour; and he felt very happy. Due to social and economic developments, this aspect of pride in achievement has more or less disappeared.

It is in this context that we have to consider the attitude of the worker towards productivity. Productivity is the maximum that can be produced under given conditions of labour, machinery, raw materials and the general environment of work. Quite a number of other important factors enter into the determination of productivity—the attitude of labour, the skill of the technician, the wisdom of the supervisors, the managerial ability of the employer, the type of machinery provided, the quality of raw materials, etc.

Proper Conditions

It is thus obvious that the attitude of labour is only one among the many factors that determine the level of productivity. Even if labour has the right kind of attitude, maximum productivity will not be attained unless the proper conditions of work are provided, good raw materials are supplied in time, and the machinery is in good condition.

Further, the various sectors of economic activity are interlinked. It is obvious that productivity in industry depends, in turn, upon productivity in agriculture. Unless agriculture produces sufficient raw materials of good quality, industry cannot produce its best.

Often international comparisons of productivity are made—for example, the productivity of coal industry in Russia and India. I have known of cases where the coal cutter in some coal mines does not get such elementary utensils as a tub. He has to wait for an hour or two before a tub is made available to him. Apart from labour hours being wasted against the national

interest, the productivity of the coal miner becomes sub-normal, not because of any inherent defect in him, but because he is not supplied with the elementary tools for good working; and often it is found that the tub is just lying somewhere and cannot be brought because of single track, etc. I am giving these examples because certain very elementary arrangements affect the productivity of the whole system.

In another manufacturing industry, I found that there was a common pool of tools and equipments. These were distributed in the morning, and everyday the worker got tools different from those with which he had worked the day before. Now everyone knows that the hands of the worker become used to given tools, and if he gets the same tools day after day, the time that he spends in getting used to them will be saved. Thus productivity can be increased considerably by certain very simple arrangements, of which we should have psychological knowledge. There are many areas, mostly very small and not spectacular, the absence of attention to which is the cause of low productivity.

Further, when we talk of the attitude of labour to productivity, we have to realise that workers are an integral part of society, and their attitudes are determined by general social attitudes. Unfortunately in our society today, the norms and social values are not very conducive to productivity. The less you work, the more respectable you are, and if you do not work at all, you are the most respectable. These are the values of the society in which we live. We cannot escape these prevailing values.

Hence when we talk of productivity of labour and its attitude to productivity, we have to think of changing the whole range of social attitudes.

The attitude of labour to productivity is also affected by the proportion of work to reward. I have noticed (whether it is

the field or the factory or the secretariat) that the attitude is, or rather the social norm is—less work, more reward. The workers cannot, therefore, be blamed, if they ask for more reward for less and less work. It is the current social attitude, and unless this standard of determining one's respectability is radically and fundamentally changed, India will have a very low place, so far as productivity is concerned, as compared to many countries of the world. So the whole social attitude towards work, labour, productivity, and production requires radical change if we have to stand in competition with the other countries of the world. If we want to become an affluent society, we have to raise the standard of the people, and that is an uphill task.

Again, while comparing productivity of the Indian worker, it is not a fact that it compares unfavourably in all sectors of the national economy. In fact, there are certain areas where productivity of the Indian worker is higher than the productivity of workers in other countries. Of course, there are many areas where productivity of our workers compares unfavourably, and certain areas where it would be nearly at par. It is a matter for serious consideration that these areas of comparative productivity be investigated, and their causes determined—social factors, mobility, etc.

Realistic Example

In this context, an interesting and realistic example comes to my mind. The workers from the eastern districts of U.P. are to be found in the cotton textile industry, practically throughout the country, whether it is Kanpur, Bombay, Ahmedabad, or Calcutta. Even brothers from the same family find jobs in different places—one at Bombay, another at Kanpur, and the third at Calcutta. It will give us a deep insight into the basic factors of productivity, if we study the relative productivity of these brothers and cousins. Why is it

that the productivity of a textile worker at Bombay is higher than the productivity of the textile worker at Kanpur, though they come from the same part of the country and are often related by blood? Why, in turn, is the productivity of the textile worker at Kanpur higher than that of the textile worker at Calcutta? Is it tradition? Is it organisation? Are there any other factors governing the situation? Suppose, again, these workers were to change places, the Kanpur brother goes to Bombay, the Bombay brother goes to Calcutta, and the Calcutta brother goes to Kanpur, completing the triangle. What would be found is that the productivity of the Kanpur brother, who shifts to Bombay, over a period of time increases because of the traditions and the situation at Bombay, and vice versa. Hence we must study the environment, the tradition and the organisation, and not merely blame labour for the productivity which is a total phenomenon.

I do not know whether the National Productivity Council has made these studies and investigated the causes of the relative levels of productivity in various lines of manufacture.

It is also interesting to investigate whether the cause of low productivity is the recalcitrance of labour, or lack of imagination on the part of the supervising staff or management, or whether the entire organisation is faulty, etc. It is these areas which need serious investigation.

In fact there are so many areas of productivity that remain unexplored. When we talk of productivity of labour, we have never cared to examine what their difficulties are—why they are not able to translate their ideas into action, why there is little consultation not only with the leaders of trade unions but with the actual workers on the shopfloor. The man who works knows his difficulties, his handicaps and also his advantages.

In the Railways, we were at one time

considering the norms of consumption of coal for the railway engines. We had a number of renowned mechanical engineers who were in charge of the maintenance of locomotives. I suggested that we should call the loco drivers who had experience of running these engines for 15 to 20 years. Why should we not try to understand from them the facts about the consumption of coal in particular types of engines which they have actually run? In fact it is they who would be knowing the coal consumption over varying distances and speeds. I found there was reluctance on the part of the engineers to consult the drivers. It is only after my insistence that the drivers were called in, and we found that they gave us very valuable information. The information not only led to an increase in the

speed of locomotives, and their proper maintenance, but it also brought out economies in coal consumption.

It is thus obvious that the reluctance on the part of the sophisticated executives to consult the ordinary operative is, in turn, responsible for the reluctance on the part of the operative to contribute his utmost towards productivity. The man behind the machine is not an automaton. He has got his own faculties, and feelings. Sometimes we find that a worker makes some very ordinary requests, say, for a particular chisel, but he does not get it. The worker says: "My dear Sir, this chisel does not suit my hands; can you give me another, with which I can work more comfortably . . .?" The supervisor looks at the chisel

'Miracle' Rice Shows Its Growing Power

The "Miracle" rice of the International Research Institute, Manila, IR8-288-3, has proved its sensational growing power in the Delhi village of Nangal Thakaran, according to a report in 'The Statesman' (Nov. 16, 1966).

The Report adds that in one acre of farmer Daryev Singh's field, this variety has yielded more than 7,000 lb of rice, the highest yield recorded so far in India.

The Nangal Thakaran field, which was one of the 1,000 National Demonstration plots laid out this year (the International Rice Year), was the only one in which the "Miracle" rice was sown. The seedlings were transplanted in July, and the crop harvested in the first week of November.

A unique feature of IR8-288-3, which is a dwarf hybrid variety, is its wide adaptability. Twenty thousand acres of land in East Pakistan and large areas in Malaysia have already been sown with this variety. The All-India Coordinated Rice Improvement Project is subjecting it to a series of tests under widely differing conditions. This variety of rice is highly resistant to bacterial blight, and has not got a strong dormancy period. Its germination and growth are not bound up with the seasons. It is believed that two crops of this variety can be grown every year even in Delhi, which has to write off the winter for rice growing, if fertiliser supply is assured. It takes about 120 lb of fertiliser per acre.

For purposes of comparison, it may be pertinent to know that the Japonica-Indica derivative, ADT-27, which is being grown in Madras, is expected to yield 3,700 lb of grain per acre. Taichung Native-1, another favourite hybrid variety, has yielded about 6,000 lb per acre.

and says: "My dear fellow, this chisel is quite alright. Why do you want another? Get along and do your best with what you have..." It is not sufficiently realised that these attitudes have far-reaching effects on the productivity of the worker. The refusal to give him another chisel disturbs his mental attitude; and once the mental attitude is disturbed, he loses his equilibrium and his productivity is adversely affected. So we need a deep study of the worker's psychology.

Position in Russia

As for international comparisons, it is no use, for example, comparing the Indian worker with the Russian worker, for the Russians have carried mechanisation to a higher degree of automation, while we are still struggling with the old machines in different parts of the economy. We have to take all these factors into consideration, before calling upon the worker to do his best.

In advanced countries, e.g., the USA, they pay a lot of attention to such matters as the colour scheme of the factory building—whether it should be green or blue or a combination of pink and blue, etc. It is really these small factors that tell a lot about productivity.

Then we come to the quality of raw materials. What are the raw materials with which the Indian worker has to work? While spinning, for example, I have found that the speed depends on the quality of the sliver. With Nawasari cotton my speed goes up and with UP cotton it goes down. I mention this only to show that productivity depends largely on the quality of raw materials.

Role of Supervisor

The function of supervisor is another important factor. He is really responsible to some extent for the productivity of the worker. If he is a good man, has intimate knowledge of the worker, often says good words to him, tries to know something

about the worker's family, about his children's education, helps him in time of need, inquires personally into his difficulties, the worker looks upon him not merely as a supervisor, but also as a friend, his sympathiser, and as a guide.

Yet another factor affecting productivity of the worker is housing. Between the productivity of two workers, one who cycles 10 miles to work in the morning and 10 miles back in the evening, and the other who walks a furlong from the quarter provided by the mill, there is a world of difference; for the cycling worker has spent a good deal of energy before he gets on the job. The other worker starts work almost fresh from the breakfast table. Actually, we are studying two different persons, though we see them in identical situations, as they stand behind their respective machines. I think this study should be undertaken by the National Productivity Council, because these attitudes are not absolute, but they are determined by social and economic conditions. In this case, for example, it would be worthwhile to consider whether the employer should provide quarters for the workers or save that capital expenditure, and let the worker cycle 10 miles every morning. If we want really to increase the wealth of the country, we will have to consider seriously the importance of these small things.

Then we come to incentives. It has often been said that unless wealth is produced, it cannot be distributed. There must, however, be an assurance that it will be equitably distributed once it is produced. It would, in fact, be a dull-headed individual who would suggest the distribution of wealth before it is produced. But if the worker has no assurance that a share of the increased productivity will come to him as an incentive, he has no motivation to increase his productivity. It is, therefore, essential that this assurance be given in advance; an assurance that if labour productivity increases without any increase in establishment cost, the major

portion of the fruits of additional productivity will go to the worker. It is a matter of detail as to the method by which the worker will get his additional reward; but the assurance of reward must be there before he can be expected to put his shoulder to the wheel.

It is not my intention to criticise management or employers. I have said that the workers are part of the society in which they live, and it is social standards which determine their attitudes. These social standards are that work is something to be avoided, and that higher reward goes to less work. There have been many changes during the last 20 years, but the norms which determine the status and the respectability of a person have not radically changed.

Science & Technology

If we want to compete with the rising nations of the world, we have to change these attitudes. Science and technology have made tremendous progress, and world forces would simply not permit us to live in isolation. We have to depend on foreign trade, because we cannot be self-sufficient in every matter. In fact, sometimes it would not be worthwhile to produce, sometimes it may not even be economical to produce certain items required by certain industries. The very requirements of economic development are such that we need imports, and to pay for them we must export. It is for this that we require high productivity, high quality, so that the cost of our goods is comparable to that of the products of other countries, and our quality is also comparable.

This brings me to an important point. If we want to sell in the markets abroad, we just cannot afford to persist in the old habit of showing one sample and sending another. Apart from our reputation being at stake, it does affect the very basis of productivity. Hence we must have, what

the productivity experts call, quality control.

When all this is done, we have to sit down with the workers and their representatives, to impress upon them that higher productivity is in the interest of the workers, and that low productivity has an adverse effect upon the basic interests and conditions of the working class; for, after all, the attitude of the workers not to increase productivity is not a deliberate one. It is a byproduct of many social attitudes, and for changing these social attitudes we need constant education of the workers. But even if the worker is illiterate, he understands his own interests, his country's interests, and the society's interests. It is a question of putting the matter to him in such a way that he thinks that his own self-interest is involved, and that the country stands to gain generally by higher productivity. There are certain fundamentals. We have to make it clear that all the achievements of science must remain subservient to man. The most sophisticated machine does require a hand to operate it. It may be just to move the handle; it may be only to press the switch, but it, nevertheless, requires the exercise of human intelligence. The most sophisticated machine will not give results, unless the operator is properly motivated and treated as the major partner in the machine-man relationship; on balance again, he must have the feeling that he is being adequately rewarded for the labour he is putting in.

I would again seriously suggest that this is a matter for investigation. We must know what the weaknesses of the system are, and find out the remedies for those weaknesses: whether they are the weaknesses of the workers or of the organisation, of management or technicians, defects in the work place, in the conditions of work, in labour relations, etc. If we do all this in the productivity spirit, labour productivity and industrial productivity will automatically go up.

I AM HAPPY to introduce to the general public "Watch Your Costs" which we have prepared for our own supervisory staff and workers.

The importance of cost consciousness and cost control in Indian industry has never been greater than it is today for, sad to say, India, from being one of the world's lowest cost producers of manufactured goods, has now become one of the highest to the great detriment of its competitiveness in export markets. This is all the more tragic in view of our desperate shortage of foreign exchange, and our heavy dependence on it for the fulfilment of our Five-Year Plans.

If our dream of becoming a great industrialised country is to be achieved, we *must* produce goods at the lowest possible cost. There are, no doubt, some reasons for high costs which are beyond the control of



industry. Nevertheless, many avenues of cost reduction are available to us if, as in other countries, all levels of management, including supervisors on the shopfloor, and the workers themselves are made cost conscious and every possible step to reduce costs is taken.

Watch Your Costs

JRD TATA

(A two-colour feature on this subject begins on Page 693)

While industrial management in India is generally as anxious to keep costs down as in other countries, we are still, in many of our industries, far behind our foreign competitors in the science and techniques of cost control. Too often in India cost control is considered the concern of accountants, while supervisors and workers are left in the dark in regard to the costs of the goods they manufacture in the belief that they should concern themselves solely with production and quality. Money, however, is spent mainly in the Factory and not in the Manager's or the Accountant's office, and it is on the shopfloor that expenditure can best be controlled by avoiding waste in the use of materials, fuel and stores, in idle machine time, in the employment of

excessive labour as well as by constantly improving efficiency. Thus, the inculcation of cost consciousness is as important amongst all levels of staff on the shopfloor as in management and accounts offices.

"Watch Your Costs", therefore, rightly addresses itself primarily to supervisors and workers on the shopfloor. Written in simple language and amusingly illustrated, it is highly readable, drawing attention to most of the areas in which costs can be reduced

or controlled by the exercise of care and attention on the part of those who are directly or indirectly responsible for expenditure of money and for the use of machines, materials, fuel, power and stores.

I hope "Watch Your Costs" will be widely read, and, by creating cost consciousness, will remind all levels of management and labour of the imperative need to control costs and thus help to solve one of the most pressing problems of the day.

Joys of an Executive

Executives are a fortunate lot. For, as everybody knows, an executive has nothing to do. That is, except:

To decide what is to be done; to tell somebody to do it; to listen to reasons why it should not be done, why it should be done by somebody else; or why it should be done a different way; and to prepare arguments in rebuttal that shall be convincing and conclusive. To follow up to see if the thing has been done; to discover that it has not been done; to inquire why it has not been done; to listen to excuses from the person who should have done it and did not do it; and to think up arguments to overcome the excuses.

To follow up a second time to see if the thing has been done; to discover that it has been done but done incorrectly; to point how it should have been done; to conclude that as long as it has been done, it may as well be left as it is; to wonder if it is not time to get rid of a person who cannot do a thing correctly; to reflect that the person at fault has a wife and seven children and that certainly no executive in the world would put up with him for a moment; and that, in all probability, any successor would be just as bad or worse.

To consider how much simpler and better the thing would have been done, had he done it himself in the first place; to reflect sadly that if he had done it himself he would have been able to do it right in 20 minutes, but that as things turned out he himself spent two days trying to find out why it was that it took somebody else three weeks to do it wrong; but to realise that such an idea would have had a highly demoralising effect on the organisation, because it would strike at the very foundation of belief of all employees that an executive has really nothing to do.

'Lord, ... keep me from getting talkative and particularly from the fatal habit of thinking I must say something on every subject, and on every occasion ... Release me from craving to try to straighten out everybody's affairs ... Keep my mind free from the recital of endless details—give me wings to get to the point ... Teach me the glorious lesson that occasionally it is possible that I may be mistaken ... Keep me reasonably sweet; I do not want to be a saint: some of them are so hard to live with; but a sour old woman is one of the crowning works of the devil ... Make me thoughtful, but not moody; helpful but not bossy ... With my vast store of wisdom, it seems a pity not to use it all—but thou knowest, Lord, that I want a few friends at the end...'

Productivity Models of Economic Growth

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ECONOMIC GROWTH is generally conceived in terms of a rising level of consumption or real income per person. Defined in this manner, economic growth can occur as a result of (a) advance in the techniques of production (in technological progress) which results in production of a greater output with the expenditure of a constant aggregate quantity of resources, or (b) as a result of an increase in the quantity of other factors per unit of labour in such a manner that real income per person rises even though the ratio of output to total input remains unchanged or even declines. The significance of technological change for the growth of the less developed countries is that it permits the substitution of knowledge and skill for resources.

Immediately after World War II, development planning was concerned almost exclusively with how to achieve a sufficiently high rate of capital accumulation to permit the achievement of national output targets¹. Since the mid-1950s, however, efforts to quantify the sources of output growth have led to a growing consensus that technological change (more broadly, productivity growth) has played an important role, relative to changes in conventional factor inputs, in accounting for economic growth in the U.S.A. and in a number of other rapidly growing economies.² As a result, development planners have been giving increasing attention to policies designed to accelerate technological change.

Technological change has been described or measured in many ways—in terms of changes in the blueprints or specifications for individual items of capital equipment; by partial productivity measures, such as changes in output per man-hour, output per hectare, output per unit of capital (or its reciprocal, the capital coefficient); and by total productivity measures, such as output per unit of total input or some index of changes in the aggregate production function.

Historically, it is possible to identify

two major stages in the evolution of attempts to quantify technological change. It now seems apparent that a third stage is emerging.

Partial Productivity

During the *first* stage, construction of partial productivity measures received primary attention (1).

$$(1) Y_t = T_t X_t$$

Where: Y_t is an index of physical output (or value added) in a particular industry, sector or economy.

X_t is an index of a particular input, usually labour, but in some cases, land, capital equipment, breeding stock or others.

T_t is a multiplier which can itself be converted into a partial productivity index.

The WPA National Research Project in the 1930s made the first major effort in the field of partial productivity measurement in the U.S.A. The National Bureau of Economic Research and the US Bureau of Labour Statistics carried the work forward in the years immediately preceding and since World War II. The issues involved in the definition of output and input and the problems of index number construction received major attention.³

Partial productivity indices, such as labour or land productivity, received rather wide popular acceptance as indicators of technological change. In part, this acceptance reflected the concern with displacement of labour by machinery during the years of high unemployment in the 1930s. Most economists, except perhaps in the field of labour economics, regarded the use of partial productivity indices as measures of technological change with considerable scepticism. It was pointed out that change in labour productivity clearly results in a biased measure of the contribution of technological change to output growth in any industry where rise in labour productivity has been achieved even partially as a result

of a rise in the ratio of capital to labour inputs.⁴ Stigler's comment that "not a single theoretical statement of any importance can be made about the average product of factors"⁵ is clearly overdrawn. Nevertheless, the use of average partial productivity ratios or indices, such as the capital-output ratio, output per manhour or per worker, and output per hectare or other unit of resource input, continues to have a stronger foundation in empirical convenience than in theoretical finesse.

Total Productivity

The second stage began during the early 1950s with the development of total productivity measures.⁶ The total productivity approach employs, either explicitly or implicitly, the concept of an "aggregate production function" (2).⁷

$$(2) Y_t = g(X_t, U_t, T_t)$$

Where: Y_t is an index of physical output (or value added) in a particular industry, sector or economy.

X_t is a set of "measurable" inputs, usually indices of labour and capital although sometimes finer input specifications are employed.

U_t is a random, or short-term cyclical variable such as weather in agriculture or unemployment in manufacturing.

T_t is the total productivity index, usually measured as a residual.

$g(\)$ is the function describing the connection among the variables, usually approximated by a function that is either linear or linear in logarithms.

Within the total productivity approach, two major traditions have developed in the U.S.A. The first, which I shall refer to as the "index number" approach, has emerged out of the work at the National Bureau of Economic Research, the Office of Business Economics of the US Department of Commerce, and the Economic Research Service

(and its predecessors) in the US Department of Agriculture. Work in this tradition is essentially an extension of the older partial productivity approach to incorporate a larger set of inputs.⁸

The second tradition, designated the "production function" approach, has developed primarily from the work of economists attached to academic institutions rather than those working at research institutes or government economic research units. They have emphasised elaboration of the theoretical foundations in order to identify the productivity index more closely with technological change.⁹

Conceptual Issues

The major conceptual issues which continue to receive attention by economists of both traditions are discussed below:

*Aggregation:*¹⁰ One desirable property of any productivity index is that it be constructed in such a way that the weighted average of the individual industry or sector productivity indices (or rates of change) should equal the mean index (or rate of change) for the economy as a whole. It also should be possible "to take the economy apart, to aggregate one industry with another, to integrate final products with their inputs, and to reassemble the economy once more... without affecting the magnitude of the Residual"—the productivity index. It seems clear that both objectives cannot be met simultaneously.¹¹

In productivity studies conducted at more than one level of aggregation—when industry productivity indices (or rates) are aggregated to produce sector productivity indices (or rates), for example—the aggregate productivity index (or rate) is typically defined as the simple weighted average of the industry or sector rates (or indices). Double counting, resulting from inter-industry transfers, is usually eliminated by defining output for each industry in terms of "value added" by the industry and inputs in terms of labour, capital (inclusive

of depreciation), and land, but nett of current inputs of raw materials.

For planning purposes, however, it is useful to be able to identify the relative contribution of both (a) conventional inputs, and (b) productivity changes to the output of products measured in conventional physical terms and not by some abstraction, such as "value added" or "sector GNP". For this purpose, the production function should contain all identifiable outputs and inputs, including raw materials, without any arbitrary exclusions from either side. When this "gross" approach is used, the aggregate productivity index becomes the weighted sum of the individual industry indices.

Aggregate productivity indices derived from use of the "value added" definitions of input and output are consistent with the first criteria listed above, but violate the second. Aggregate productivity indices derived from the "gross" approach are consistent with the second criteria, but violate the first. The design of a system of productivity accounts should permit the construction of industry and aggregate productivity indices in which raw materials are alternatively included and excluded from the productivity function.

The Production Function: Practitioners of the productivity function approach typically have used a Cobb-Douglas (linear in the logarithms) production function with the productivity coefficients estimated from relative factor shares, while practitioners of the index number approach usually have employed linear price weighted indices.¹² In practice, the difference between the two approaches has frequently boiled down to whether the index of total input is to be based on arithmetic or geometric weights. Once the form of the production function is specified, the rest of the business comes down to little more than hunting (statistically or otherwise) for an acceptable set of weights. The geometric weighing procedure has the advantage, from production

perspective, economics of imposing a diminishing, rather than constant, marginal rate of substitution among inputs. Consistency also would seem to require that outputs also be weighted geometrically.¹³

The use of either individual prices or factor shares as weights in constructing the input index is "correct" only if the sector operates in a perfectly competitive market, and is in long run equilibrium. Attempts usually are made, therefore, to select periods "relative" equilibrium as base periods for weight selection and linkage. Where relative equilibrium cannot be assumed, it

would seem reasonable to experiment with statistically derived weights.¹⁴

Neutrality: If a total productivity index is to serve as an unambiguous index of technological change, the net effect of technological change on the aggregate production function must be "neutral". Shifts in the production function are "neutral" if they leave the productivity coefficients unchanged, and simply change the output obtainable from given inputs.¹⁵ When technological change is non-neutral no single indicator, such as a total productivity index or the "constant" term of a production function,

Mathematicians' Role in Industry

Mathematics can be an aid to management decision. Speaking on this subject, at a meeting of the Madras branch of the National Association of Purchasing Executives, Dr Alladi Ramakrishnan stressed the importance of making use of mathematicians for many productive purposes in industry.

Dr Ramakrishnan, who is the Director of the Institute of Mathematical Sciences, Madras, spoke on the utilitarian aspect of mathematical science by referring to certain problems of operational research in airline management. He illustrated his points by referring to the contributions made by mathematical research in tackling airport congestion in Chicago and London through a scientific handling of the queues at the counters for tickets.

He referred to two theories developed in this connection—"The Theory of Queues" and "The Theory of Storage." The British European Airways had realised the utility of applying mathematical research for this purpose. The findings of such research were of great value to the airline company which expected to handle aircraft every two minutes by 1969.

Giant business houses in the USA, like the IBM, paid "fantastic" sums to reputed mathematicians just to get them on their panel. It was the USA which had realised the utility of abstract sciences, like Mathematics, and industry there had taken full advantage of this. Dr. Ramakrishnan said that the yearly output of mathematics graduates in India was quite "overwhelming". But many of them "disappear into the mainstream" of ordinary life in India, while "such a potential would have been enough to send rockets to the moon" in other countries. He appealed to the industry to make use of the mathematical talent in the country, especially as the demand for work in creative mathematics was very small.

can adequately measure technological change.

It is difficult to conceive of any individual invention or innovation that is neutral. At the micro level, technological change almost certainly involves a shift in the relative values of the individual factor productivity coefficients as well as a shift in the "constant" term of the production function. Fortunately, the neutrality tests that have been attempted, although not conclusive, seem to imply that the net effect of technological change on the aggregate production function has been approximately neutral over relatively long periods.¹⁶

Filling Productivity Gap

A major limitation of the total productivity approach for development planning is that it does not provide a clear indication of all of the instrumental variables which must be manipulated to bring about productivity gains. At the micro level, it seems apparent that technology is always "embodied" in particular factors. "...When all the factors are completely specified, the technology is also specified."¹⁷ In order to introduce a new technology, it must be embodied in a set of factors that differs qualitatively from the set formerly employed.

This concern has given rise to a further stage in the development of productivity analysis.^{18,19} A number of economists are making a major effort to account for the sources of output growth which are left unaccounted for by conventional measures of labour, capital, and raw material inputs. These additional sources of output growth are frequently grouped under three headings: (a) changes in the quality of labour inputs; (b) changes in the quality of capital inputs; and (c) a new residual frequently identified as either changes in scale or changes in allocative efficiency.²⁰

The efforts to quantify investment in education, to measure its effect on the

quality of the human agent, and to identify the effect of such changes on output, clearly have reduced the size of the productivity gap. Efforts to introduce adjustments for the quality of capital equipment directly into the production function point the way towards more effective treatment of the role of capital accumulation and investment in the introduction of technical change into the productive process. It seems rather clear, however, that in large economies or in industries with a large number of firms, scale economies are primarily a phenomenon that accompanies the equilibrating process following the introduction of technological change. In smaller economies, or in industries with few firms, it may be somewhat easier to distinguish scale economies from technological change. It would appear that scale economies, as currently measured, represent little more than (a) the reintroduction of "disembodied" technological change under another name, or (b) a reflection of underutilisation of existing productive capacity.²¹

A major issue is whether quantification of the effect of qualitative changes and inputs contributed by the public sectors on output growth can be expected simply to reduce the magnitude of the productivity gap or to eliminate it altogether. Schultz, Solow, and Griliches now appear to assume that the residual should be eliminated completely. But Denison and Salter take the position that a substantial residual or gap will remain even after adjustments for quality changes, and that the major analytical task is to identify the relative importance of the several factors that give rise to the productivity gap.²²

The two positions are not entirely inconsistent. In a functional sense, any change in output must be related to one or more changes in factory inputs and is, therefore, completely accounted for by the change in input. On the other hand, firms find it profitable to replace existing factors by new factors of higher quality only if the

value of output rises relative to the value of inputs. The ability to identify completely the sources of output growth is not, therefore, inconsistent with the use of a total productivity index to measure the resource savings or output gain resulting from technological change.

Summary and Conclusion

Initiation of a system of productivity accounting probably should proceed in the following sequence:

(1) Construction of partial productivity series for labour, capital, and raw materials for each major sector of the economy. Particular emphasis should be given to the problem of quality changes in the design of the factor input and product series.

(2) Construction of factor share estimates for each major sector of the economy. The factor share estimates should be consistent with the factor input and product series identified above.

(3) Construction of "net" and "gross" total productivity estimates by sector and for the total economy.

(4) Continuous experimentation with functional approaches; regional and industry disaggregation; and others to reduce or to understand the factors responsible for any positive or negative productivity gaps which emerge.

Each step complements and builds on previous steps. Only when step (3) is completed will it be possible to determine whether the "empty box" represented by the "productivity gap" represents a major problem for further analysis.

The feasibility of introducing a system of productivity accounts depends on the progress that has already been made in a nation's social accounting system. A national income labour statistics, and price reporting system capable of generating accurate measures of annual changes in

both "current" and "real" output and employment by sector is an essential prerequisite.

The utility of a system of productivity accounts depends on the manner in which the central government participates in the planning and management of economic activity. Under a system of decentralised management where the government (a) utilises generalised monetary, fiscal, and commercial policy to regulate the level of economic activity and the rate of economic growth, and (b) concentrates direct public investment primarily in the fields of "social overhead" and on the support of research, development and education, the partial and total productivity trends and input-output ratios generated for broad sectors of economic activity provide useful tools for measuring economic performance and for policy guidance.

Data on the rate of growth of inputs, output, and productivity in agriculture, for example, can provide a guide to the success of agricultural research and extension investments. Such measures also represent essential tools in (a) projecting future raw material, land, and manpower utilisation for the agricultural sector, and (b) planning for the absorption of rural workers and new entrants to the labour force from rural areas into the non-farm labour force.

Productivity accounting represents a useful addition to a national social accounting system. It is particularly useful for the exploration of questions dealing with the level of inputs necessary to support alternative rates of economic growth. And it provides many of the elements out of which more complete planning models, which include (a) product demand functions, and (b) factor supply functions in addition to (c) the productivity relationships discussed in this paper, can be built. Economies which have not yet initiated a system of productivity accounts can take advantage of the professional discussion that has been

reviewed in this paper. They should be able to avoid many of the limitations, particularly the inadequate treatment of qualitative changes, which have been built into the system of productivity accounts in the USA and elsewhere.

Appendix on Aggregation

Definition of inputs and outputs on a gross rather than a value added basis results in an understatement of the productivity index at the industry or sector level relative to the aggregate or economy level since the productivity index for the economy as a whole becomes the weighted *sum*

rather than the weighted *mean* of the individual sector indices.

Assume, for example, an economy consisting of two sectors—agriculture and processing. Assume that all the product of the agricultural sector is used in the processing sector. The production functions for the two sectors and for the economy as a whole can be represented as follows:

For Agriculture:

$$(1) Y_1 = A_1 L_1^{\alpha_1} K_1^{\beta_1}$$

For processing:

$$(2) Y_2 = A_2 L_2^{\alpha_2} K_2^{\beta_2} Y_1^{\gamma}$$

For the economy as a whole:

$$(3) Y_2 = (A_1^{\gamma} A_2) L_1^{\alpha_1 \gamma} L_2^{\alpha_2} K_1^{\beta_1 \gamma} K_2^{\beta_2}$$

Where:

Y = index of output in physical terms.

A = total productivity index.

L = index of labour input in physical units.

K = index of capital input in physical units.

α = ratio of the value of labour input to the value of output in the base period.

β = ratio of the value of capital input to the value of output in the base period.

γ = ratio of the value of raw materials to the value of output in the base period.

The total productivity index can also be expressed as $A = (1+r)^t$, where: t = the number of years covered by A, and r = the annual rate of change in A.

If between t_0 and t_1 (a) the productivity index rises from 1.0 to 1.7 in agriculture; (b) from 1.0 to 1.4 in processing; and (c) $\gamma = 0.5$ in the base period, the productivity for the economy as a whole will be:

$$(4) \Delta E = (A_1^{\gamma} A_2) = (1.7)^{0.5} (1.4)$$

$$= (1.3) (1.4) = 1.82$$

How to Avoid Wastage of Rice

India produces enough rice for its people, but as much as 15 per cent of what is produced goes waste, asserts the Central Food Technological Research Institute, Mysore.

The Institute points out that faulty handling methods, inefficient storage practices, and wastage in milling account for the huge loss. By adopting improved technique in milling, losses in the form of broken rice and powdered rice can be reduced, and rice lost in bran can be recovered. An increase of at least two per cent—about five-lakh tonnes—in the yield of rice can thereby be obtained. Hullers, which are found all over the country, are inefficient and wasteful. They account for four per cent loss. Parboiling improves the yield, and reduces the breakage during milling. It results in an increase of 1.5 per cent. Rice bran contains 5 to 10 per cent rice germs.

In this example both of the sector indices are lower than the index of the economy as a whole. It can be shown that if the processing industry absorbs any of the product of the agricultural sector (that is, if $Y_2 > 0$ then $A_E > A_2$) more generally, the index for the total economy will be higher than the index for any sector.

If the output of the processing sector is defined on a net basis—after subtracting the raw materials purchased from the agricultural sector—the production function can be rewritten as:

$$(2.1) Y_2' = A_2' L_2^{-\alpha_2} K_2^{\alpha_2}$$

A_E can then be computed as the weighted mean of the A_1 of the individual industries or sectors.

$$(4.1) A_E = A_1(Y) + A_2'(1-Y)$$

Domar states that only the productivity index of (4) is correct. Massell argues (a) that the aggregate productivity index of (4.1) is a measure of the productivity growth due to intra-industry changes in technology, and (b) that the difference between the

$$\text{two indices } \left[\left(A_E \right)_4 - \left(A_E \right)_{3,1} \right]$$

measures the effect of inter-industry resource shifts on aggregate productivity. I have argued elsewhere (see Reference¹¹) that A_E as defined in 4.1 is the relevant aggregate productivity index for inter-industry comparisons.

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$$A_L \leq A \leq A_P$$

If, however, technological change is strongly non-neutral, it is possible to obtain an apparent reversal of the index number bias and

$$A_P \leq A \leq A_L$$

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20. Griliches, *op. cit.* (1963) identifies the new residual as economies of scale. It is identified as a change in allocative efficiency resulting from the movement of factors of production from low productivity to high productivity employment by B. F. Massell, *op. cit.* In "Aggregate Production Function and Medium-Range Growth Projections," *American Economic Review* (forthcoming), R. R. Nelson refers to a third set of factors including "improved efficiency in the allocation of resources principally the result of movement of factors of production from low productivity to higher productivity jobs, and better advantage taken of opportunities for specialization and economies of scale," p. 11 (*Mimeo*).
21. Solow, *op. cit.* (1963); Salter, W.E.G., *Productivity and Technical Change*, Cambridge University Press, London, 1960, pp. 140-142.
22. Denison, *op. cit.*, pp. 234-237, 254-255, 264-274; and "The Unimportance of the Embodied Question," *The American Economic Review*, Vol. 54, #2, Part I, March 1954, pp. 90-94. Salter, *op. cit.*, pp. 1-10.

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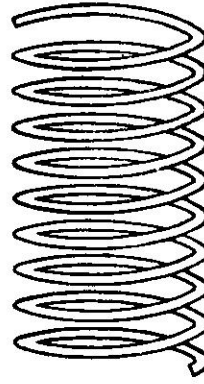
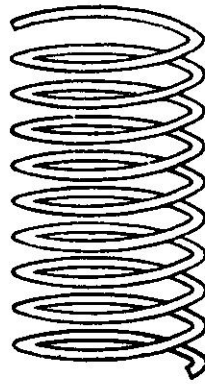
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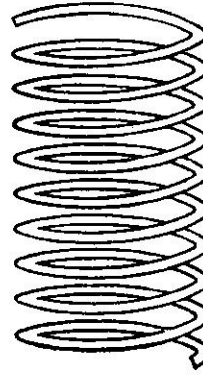
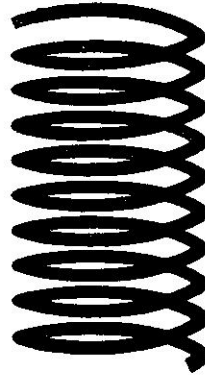
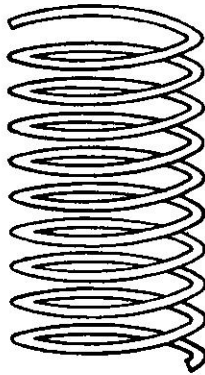
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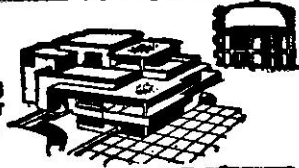
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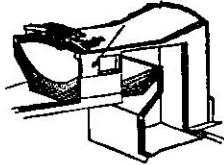
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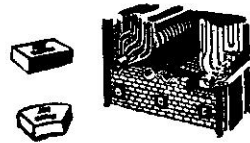
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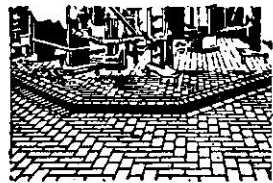
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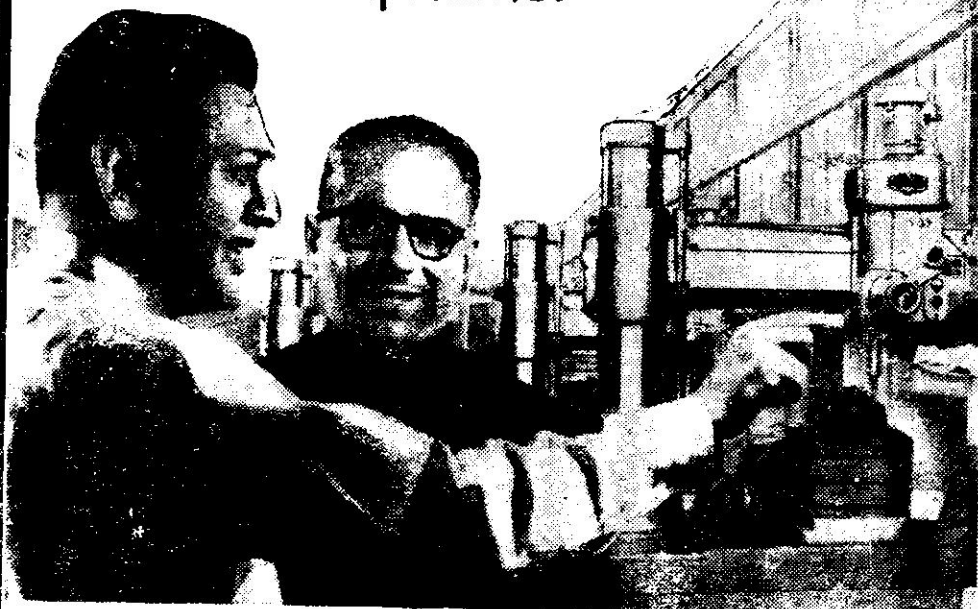
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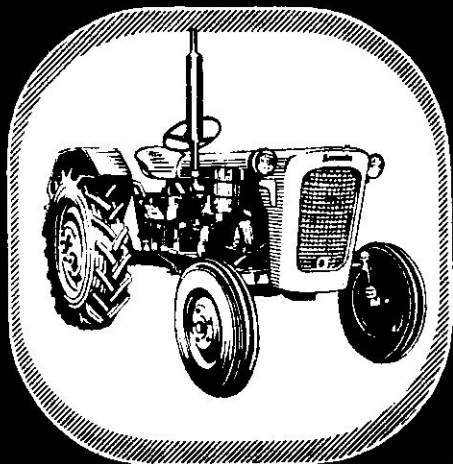
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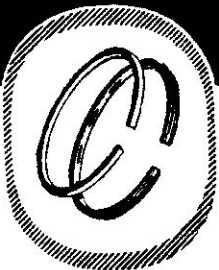
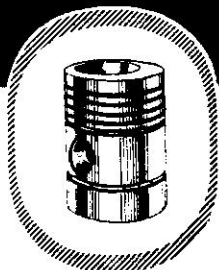
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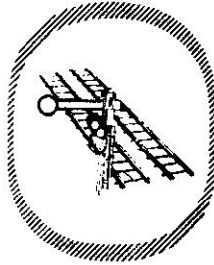
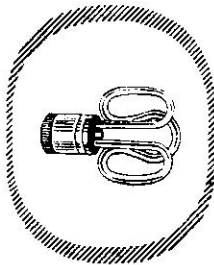
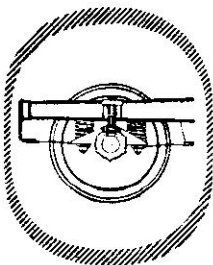
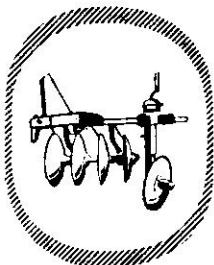
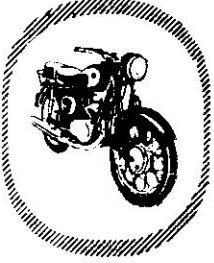
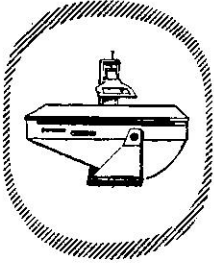
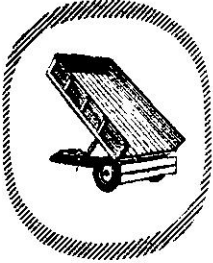
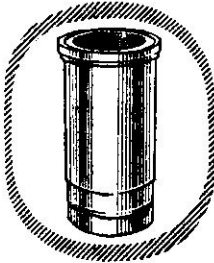
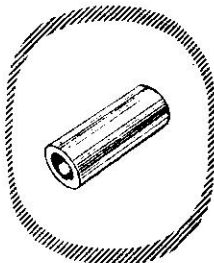
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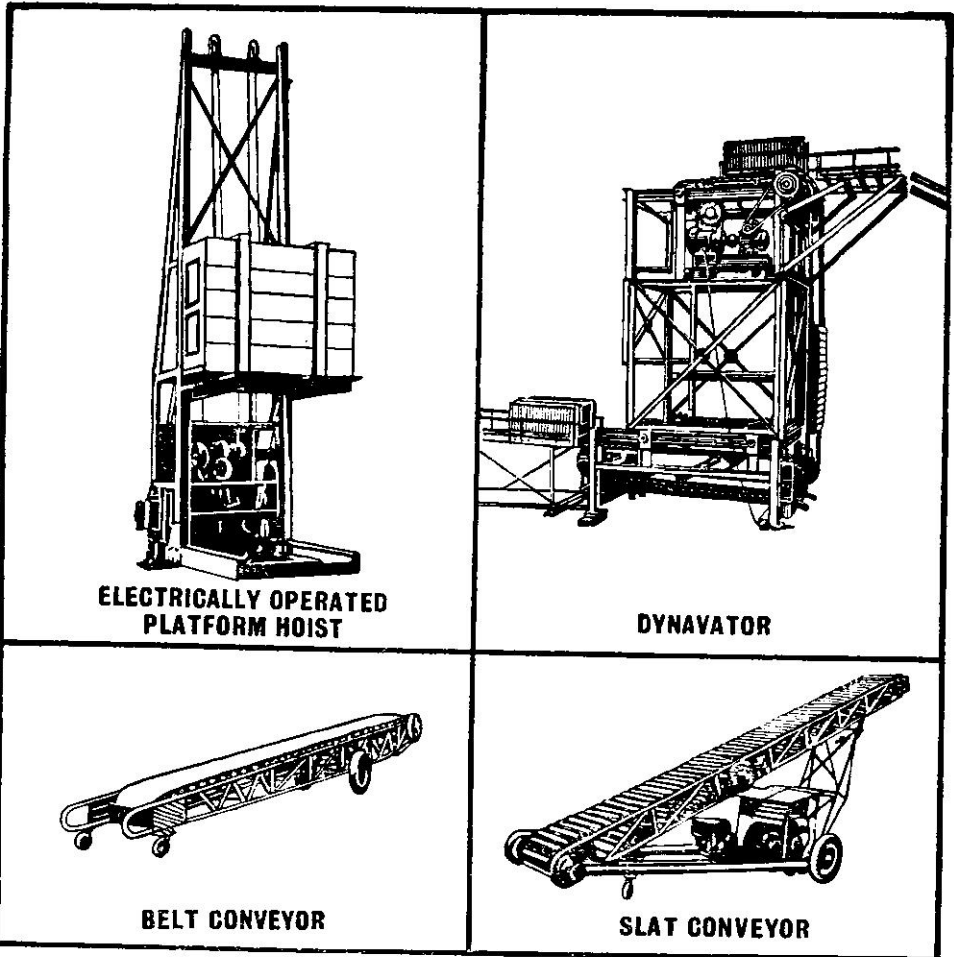
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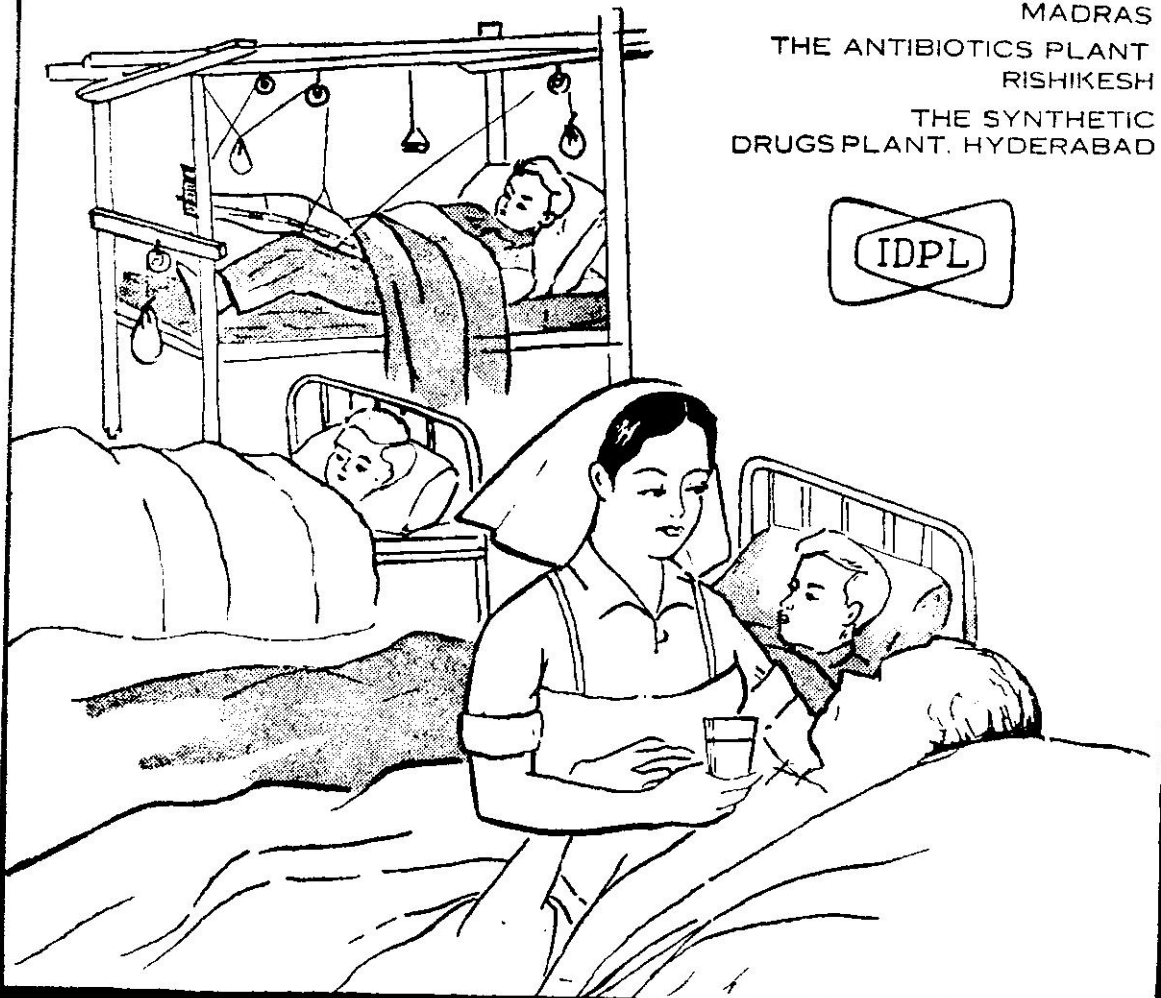
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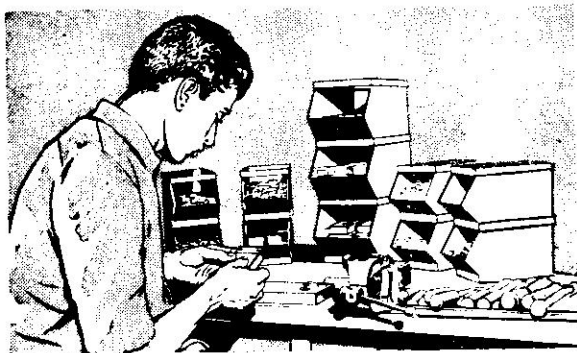
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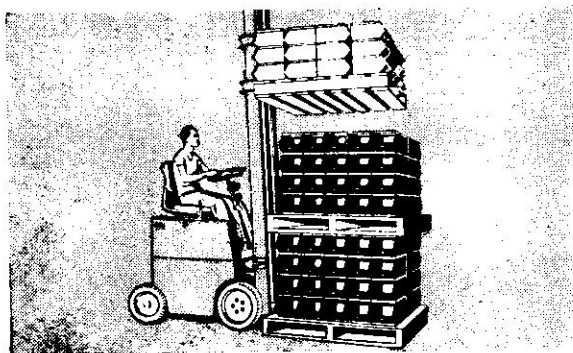
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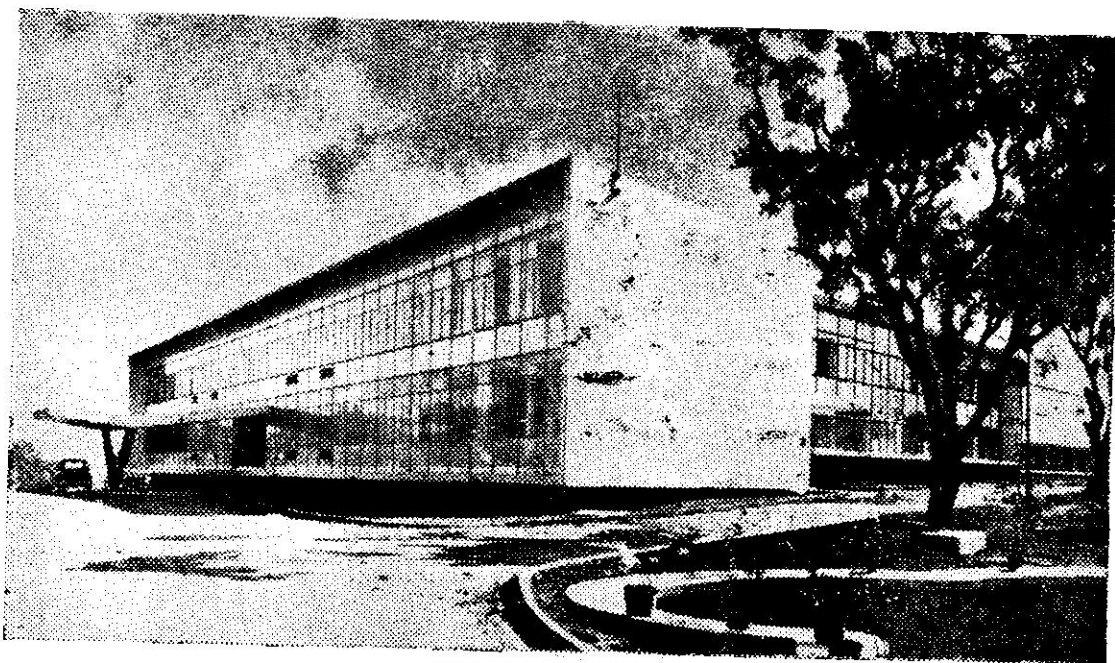
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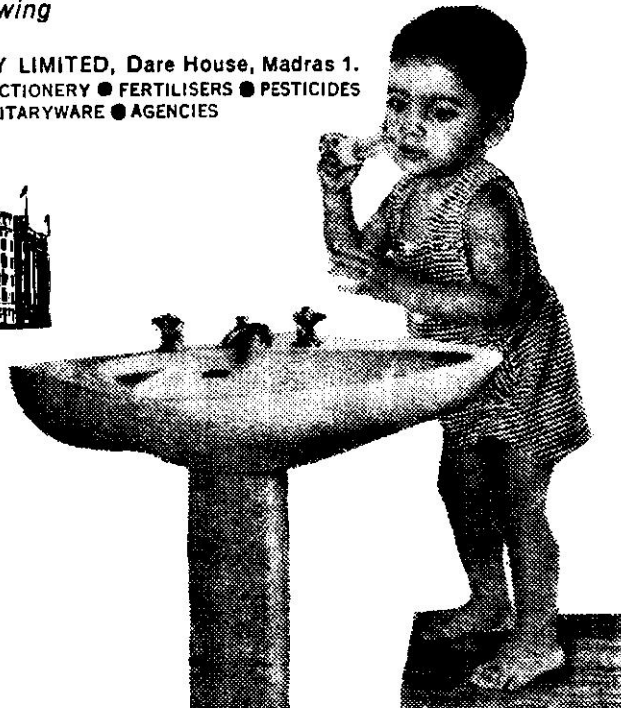
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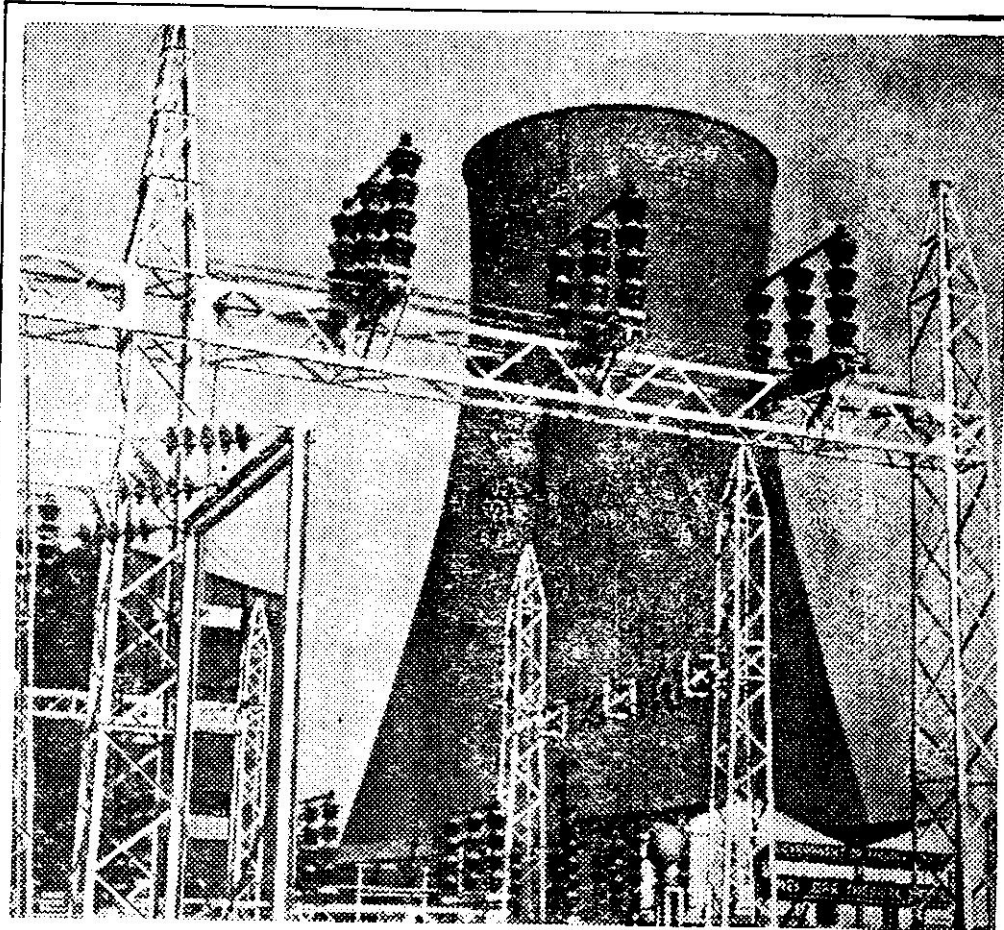
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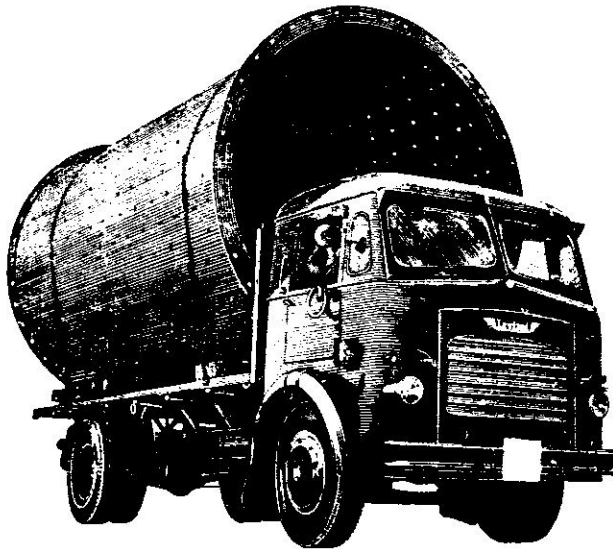
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Health of the Industrial Worker

NOWADAYS there is much search and research going on all over the industrial world to increase productivity. All this labour, however, bears little fruit when the search is intensive in wrong directions and haphazard in the right one—when the study of nature knows no limit and that of man lags behind.

In theory, few deny that 'Health is Wealth', and health is not simply absence of disease, but a spiritual force to do and dare in the service of humanity against any odds. In practice, however, many deny that creation of wealth is dependent on the health of the industrial worker—his total health—physical, mental, social, and spiritual.

There are many attractive sources of productivity like technology and its machines of increasing size and speed, administrative reforms, statistics and computers, planning, training, budgetary control, and what not. All these sources are very necessary to increase national wealth. But none of these sources can produce results, unless, side by side, everything is done to advance the health of the nation, and especially of the industrial worker. The total health of the worker is the mainspring which, and which alone, can put life in the other sources of productivity outside man. The abode of productivity is within man, and not anywhere outside him. It is a child of the emotions and aspirations of the unpredictable worker, be he a manager or janitor.

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Industrial Medicine

Science studies nature far more avidly than man. One reason for this preference is that it is far easier to study nature than man, for the former is exact, free from all emotions, and because it works throughout through definite measureable natural laws, whereas man is a baffling bundle of changing moods and emotions, and unpredictable.

The science of nature is flooding the world, and especially the industrial market, with technological progress which promises much, but performs less in the absence of an equal advance in the science of man. The former provides man with a highly dangerous tool of atomic energy which can uplift or ruin man, depending upon how it is used. But it is only the latter which can teach man the wise use of so dangerous a tool as atomic energy, especially when it comes in conflict with man's emotional energy which is as powerful and as dangerous as atomic energy. The progress of man towards a more humane civilisation depends on the wise use of both these energies, for man cannot be separated from his environment. There is trouble when either tries to act independently of the other, for, both are interdependent and not independent.

Main Purpose

The main purpose behind industrial medicine is to train modern industry to realise the truth of the interdependence of atomic and emotional energy. But, as Wordsworth has said, 'Wisdom is oft times nearer when we stoop than when we soar.' And the siren songs of technological progress, promising easy, quick and generous material gains, attract many men to soar higher and higher to conquer nature even at the cost of human values, and they so smother the voice of man's conscience, that only few see sense to stoop and listen to its warning that it is more important for

man to conquer himself before nature.

Manpower is far more important to industry than machine-power, and the main objectives of industrial medicine is to maintain it in total health of body and mind. The future of the country depends on increasing the productivity of the industrial worker. This, however, depends on his health—and health, growth, and progress are synonyms. Moreover, in the ultimate analysis, productivity is a social concept, and the real measurement of the worth of any society is to translate technical progress into human progress, and profits come automatically if business is based on human values, for a "man is the measure of all". Inner vision is necessary to look into the heart of reality, and this has much to do with the holistic theory of health and disease which is out to consider the total man in his total environment. Industry and medicine of the future have to swim or sink together.

Between any plan of science and technology and its execution is man who is more complex than any plan. Necessity, not choice, is forcing both industry and medicine to depend more and more on each other for their future growth. Today's challenge of the atomic age to the medicine of tomorrow is preservation and promotion of the total health of man both of body and mind. And medicine has accepted that challenge by giving birth to industrial medicine whose main objective is to weld science and philosophy together to prove that productivity is humanity in action.

Productivity for Progress

Programme for Small Scale Industry

K PENNATHUR

Executive Director, NPC

MENTION of the word "industry" brings to our mind the vision of mammoth organisations running automated machines humming with activity, and producing an unending stream of finished goods. They are always in the public eye through their products stacked on the shelves of stores, their names prominently displayed in lights, their appearance in the financial page, and their talent-spotting pursuits in the "Situations Vacant" columns of newspapers.

But this is not the true face of industry. It is not a smoothly running automated machine. New opportunities arise day after day and these can only be grasped if one is alive and adaptable. Also, new problems arise which have to be solved to enable the industry to function efficiently. Up and down the country there are industries—large, medium and small—struggling hard to face the challenge of the times. Problems are mostly similar—so are their solutions—but they affect each sector with different degrees of intensity. The aim of this paper* is to analyse some of the problems facing small-scale industry, and to explore how far the application of productivity techniques can assist in overcoming them.

Strong Points

Before dealing with the problems, and discussing the possible solutions, a brief survey of the strength and weakness of a small business is perhaps necessary. To be effective, the solutions should not only examine the difficulties, but should attempt to put the intrinsic strong points to use in the process.

Some of the strong points of a small business are — the drive, initiative, and personal stake in the business of one individual; his capacity for rapid action; personal contact and leadership; no necessity for an

* The author wishes to acknowledge the valuable assistance rendered by Miss Ena Chaudhuri, of the NPC, in the preparation of this paper.

elaborate, expensive, and bureaucratic management hierarchy; lower overheads and establishment cost; little or no expenses on prestige office accommodation and amenities; the flexibility and potential growth rate of a small business; with a little effort a small firm can increase its share of the market without any appreciable result on the market, but with a dramatic effect on the firm; and given a limited range of activities, any improvement can produce startling results.

Some of the difficulties of a small business are—less access to capital; greater necessity for financing business with retained profits, although profit margins are narrow; temptation to book more orders than the firm can produce, frequently at a smaller margin of profit than it can afford, in an attempt to enlarge its market; frequently competition is against larger firms operating newer and faster machines; lack of resources for research, development, analysis and improvement of its processes; inability to recruit first class professional managers and to train existing staff to higher levels of competence; and inability to pay high wages to labour and hence shortage of skilled labour.

These may be cliches, but, nevertheless, they are facts, and solutions to problems can be found mainly by developing the strong points further. Some of the factors enumerated above could very well be applicable to larger firms, who are by no means immune to some of these difficulties. But there is no reason why the performance and profitability of small firms should be inferior to those of large ones. The entrepreneurs of a small firm should not be satisfied with the mental attitudes and methods of work applicable at the time of establishment of the business. It is not imputed, for one moment, that small firms are backward or inferior—but only a suggestion that if we do not seize opportunities now by exploiting markets, reducing manufacturing costs, and developing an attitude of looking at ourselves afresh,

transition from the feeling of uncertainty and frustration to one of confidence and progress, will never take place.

Management

The small firm is characterised by the fact that it is generally managed by one man, or at the most one man assisted by one or two others. Now this man, who has built up the firm from scratch, and devoted all his time, personal savings, and technical knowledge, and perhaps even sacrificed his health in the process, is certainly a very dynamic and dedicated person. This is his personal stake, and he wants to know what is going on all the time. He performs all the management functions himself—forecasting, planning, organising, directing, coordinating, and controlling. He probably even has to inspect items before shipment, or check machines not functioning perfectly. He certainly looks after almost all his purchasing, production, packaging, advertising, sales promotion, marketing, after sales service, personnel management, financial management, and general administration functions—a very wide and diverse range of activities indeed.

Specialisation

In the context of the multipurpose entrepreneur-manager described above, one would imagine that there is little scope for specialised management in small units. Of course, the management of a small firm does not lend itself to a high degree of sophistication. The man who sets up the business should be more involved in policy and overall planning rather than with day-to-day routine management. For the latter, he should build up a small team on whom he can depend for most of the routine management, and develop, in addition, a sense of confidence in them so that they are gradually able to take bigger decisions.

The degree of specialisation imparted to the small management group would, of

course, depend on the size of the firm, and the extent to which the techniques would be applicable. One has to arrive at a balance between the need for specialisation and the firm's capacity to utilise and meet the expenses of such specialised management. It is possible to work out a system which would be applicable to individual small-scale firms, taking into account the specialisation already available, its scope for further development and use thereafter, and other specialisations necessary for the effective functioning of the unit.

The growth and performance of a business would naturally depend upon how it fares *vis-a-vis* other firms in the industrial set-up as a whole, and on internal factors such as management of its finances, methods, men, materials, equipment, and marketing.

External Aspects

The small firm has to be vigilant about its share of the market, the economic conditions affecting business generally, and its own line in particular, and about the possibility of switching over to new types of products, should there be a change in the situation. This involves keeping in touch with the latest developments in technology, production processes, and information about the industry. Groups of small industries find it worthwhile to create and subscribe to technical advisory service organisations.

The development of the system of sub-contracting in Japan has not only assisted in the growth of small-scale industry, but has made small business owners quality- and standards-conscious and alert in a competitive world. In some industries, the dependence on sub-contractors is around 40% in terms of production cost. There is a desire on the part of most large industries to become self-sufficient and dependent on their own resources. In the face of this tendency, and constant technological changes, small firms have to watch out for any

developments which might affect their business.

While a small firm manufactures components for a larger firm, it should constantly examine whether, in its turn, it cannot sub-contract to other firms. It is, therefore, essential for the entrepreneur of a small business to carry out a "make or buy" analysis with respect to every sub-assembly or sub-component he manufactures. Whenever he finds it more economical to sub-contract or sub-sub-contract manufacture of components to other small units, he should cease to produce it himself.

Training

Whatever the size of the firm, or its line of business, there are no two opinions about the fact that those who work in it should have the opportunity of continuous training. There should be a constant endeavour to upgrade the skills of managers, supervisors, and workers. Management should be trained to develop an analytical, questioning approach — not to take things for granted even if they look good. Both management and supervisors should be trained in the art of guiding and leading people, in developing cost and quality-consciousness, and in an attitude of constant search for technical excellence. Workers should be given every incentive to better their skills by taking advantage of training facilities available in the area. Groups of small firms might also get together to arrange training of workers.

If asked to suggest one technique which would be of maximum use to small firms, I would straightaway say Work Study. It is the one technique which brings dividends out of proportion to all the initial outlay on it.

The other subject areas, a study and application of which would be of value to small firms, are — Cost and Budgetary Control; Materials Management; Value Analysis; Quality Control; Utilisation of Plant and Equipment; Ergonomics; Fuel

Efficiency; Personnel Management; and Marketing.

NPC's Services

The National Productivity Council has had the privilege of providing services to industry in most of the above areas. This has been done by organising training courses, seminars, and Productivity Survey and Implementation Service (PSIS). An essential part of the NPC training programme is the project work undertaken by participants of these courses. This enables the participants to apply, in practice, the principles learnt in the theoretical sessions. It also develops in them a confidence and a capacity to take a detached view of their work.

In regard to PSIS, NPC specialists visit individual plants to locate problem areas in management and operational practices in individual industrial establishments, analyse existing methods, suggest improved methods, and assist the units concerned in the implementation of the improved methods through the application of Industrial Engineering, Industrial Relations, Industrial Management, and Fuel Efficiency techniques.

Both in training programmes and PSIS projects, NPC has met with problems which are not necessarily complicated, and which require simple solutions. The problems might have been caused by various factors, but broadly, one might venture to suggest that bottlenecks and difficulties crop up as attitudes and methods fall behind the demands of the present, and continue to be guided by the traditions of yesteryear. In the following paragraphs an attempt is made to describe briefly some of the areas in which Productivity Improvement Programmes would be of assistance to small-scale industry.

In a small firm, where it is not possible to recruit full time Work Study specialists, it would be desirable for all those

directly supervising the work of operatives to receive training in Work Study. This would enable them to bring to their problems an objective, systematic, and critical approach to evolve the most practical solution. The subject suggested in this programme is a Work Study course of 10 weeks' duration, dealing mainly with Method Study Principles and application.

If entrepreneur-managers of a small firm are unable to devote all the time required for a course of this duration, they could attend, for six days, a part-time appreciation course of two hours' duration, daily. This would enable them to get an idea of the sequence of inquiries and analyses to be conducted in a project. All too often there is an eagerness to introduce incentive payments in an attempt to get greater contribution from labour before the application of Work Study. People get so used to machines waiting for work, or to direct operatives spending time on non-productive work, that they do not realise that solutions can very often be found in the rectification of these and similar problems.

By way of an example of the application of Method Study, I shall refer here to the area of study of a project undertaken by a PSIS team of NPC in a small firm, and its recommendations. The team was asked to study the existing method of working of the factory and to suggest improved methods so as to obtain an overall increase in productivity; to propose a layout for improved set-up of working; and to suggest a system of codification of parts for initiating a production planning and storage procedure for the factory. The team made a survey of the prevailing practices, analysed them, and made the following recommendations:

- (a) a suggestion for the sequence of work in the assembly sections;
- (b) a new layout for the suggested sequence of operations;
- (c) strict adherence to specifications,

- whether the parts were made in the factory or bought from outside;
- (d) constant checking and rectification of dies, jigs, and fixtures;
 - (e) preparation of codified lists of parts for machines manufactured by the company;
 - (f) a suggested master schedule for assemblies and components; and
 - (g) suggestion to sub-contract some of the work of an overloaded section to an outside firm.

The time taken for the project was approximately two months, including survey, analysis, preparation of forms and report writing. It was estimated that if all the recommendations were implemented, the new scheme would increase the production of one particular type of machine from about 100 to nearly 200 per month.

At a first glance the small firm's financial difficulties appear to be shortage

of capital rather than proper utilisation of its financial resources. Entrepreneurs sometimes do not realise that profits which look comfortable might conceal sales of equipment or property which tend to inflate the figure. The profitability of different items manufactured by them may not be of the same order. A budgetary control system would help them to distinguish between profitable and loss-making activities. They would find that on certain items they would be able to make a profit of 40% or more, and on others no profit at all. A product-wise cost analysis would enable them to intensify the production of the highly profitable items, and to discontinue those on which profit is comparatively low.

Materials Management

Materials constitute a large segment of the manufacturing cost of a product. In large companies manufacturing automobiles

Vacuum Lifters & Handlers

A new non-electric vacuum lifter that develops its own lifting power, by creating energy from the atmospheric pressure, has come into industry, reports the London Engineering Correspondent of "The Hindu".

The new device will handle quickly and automatically steel, aluminium, stone, rubber, glass, fibre board, and wood. It is operated in conjunction with a crane, hoist or other lifting device, and consists of three main parts—a suction pad, vacuum cylinder, and piston. When the pad is located on the load, the weight of the unit actuates the piston, which extracts air from the pad to provide the necessary gripping power. This grip is maintained as long as the weight of the load is on the piston and when the valve on the line connecting the lifting pad with the vacuum cylinder is closed. Release of the grip is obtained by opening the mechanical valve. The maximum lifting weight is 1,000 lb; and multiples can be used for lifting larger and heavier loads. A simple, but accurate, visual indicator gives a warning if the load exceeds the rated capacity.

For heavier work, various types of lifters and handlers are available. Typical of recent installations is a large vacuum beam lifter for non-ferrous strip, suitable for a safe working load of 3,400 lb. and handling hot brass slabs. Another example is a vacuum steel plate handler, capable of lifting and conveying over 4½ tons of steel plate, and requiring only one man to operate, instead of three needed earlier. Yet another is a vacuum air stacker, designed to speed up production and eliminate manual handling of sheets of any material.

and heavy engineering equipment, it can be around 68%. In others, it is still higher. In small-scale units, too, materials hold up a large part of the company's outlay. In fact, some surveys have revealed that as much as 75% of the cost of total input goes towards materials. Materials kept in store, some of which may not be required for months, materials in process, finished goods waiting for despatch—all these are locked-up capital which could be invested in more profitable ventures. One pays for storage space, obsolescence, and for transportation of materials. Add to it the fact of scarcity of materials, and one could almost double the potential saving to the business which might have accrued with better planning of material procurement and utilisation. Further, a small firm is not able to buy in bulk, and, therefore, pays a higher price per unit. Materials Management covers the whole gamut of activities concerned with materials—procurement, transport, inventory control, and a critical examination of products and processes to ensure the most effective utilisation at the lowest possible cost.

Economy of Materials

It is necessary to analyse what economies can be effected in the purchase of materials. Although it may be rationalised that the wasted materials can be re-utilised, in many cases the re-utilisation is restricted in view of thermal and other stresses induced in the materials during the previous process. Further, there is the cost of labour which is wasted over producing a defective item.

In a recent survey, a PSIS team of NPC found that a company was unnecessarily holding materials for months, sometimes years, and could easily reduce its inventory cost. Some of the material consisted of valuable imported chemicals which were exposed to the elements for lack of storage space. An ABC analysis was carried out at the factory, and it was sug-

gested that by adopting Inventory Control techniques it could reduce its inventories by over Rs. 2 lakhs, thereby releasing money for important developmental work.

Value Analysis

In the scarcity economy of today, a great deal of attention has to be paid to the quality and quantity of materials consumed and the reduction of waste of materials through minimising of rejects by narrowing down the range of errors possible on machines. A Value Analysis process should make a critical analysis of the utility of a product, namely, its purpose, function, and prestige value; the quality and quantity of the materials used to make it; and the equipment used in making it and the permissible tolerances.

The National Productivity Council was invited by a company to investigate the reasons for the high rejection rate of a particular casting. This casting formed an important part of a bicycle, and it was essential that it should conform to certain specifications. It was found that the rejections were as high as 60%, and some of the reasons for this were (i) shifting of patterns, (ii) incorrect dimensions of the patterns, (iii) shifting of cores, and (iv) poor surface finish. In the system prevalent at the time of the project, the patterns were divided into two halves which were not properly aligned, and the cast iron boxes were not faced on both sides. Two points (pin holes) were used for alignment, and this did not give the desired result. The patterns did not strictly conform to the drawings, thus failing to maintain the tolerances. The cores were positioned in a hurry, causing 15% rejection due to this reason alone. The sand used for the surface finish of the castings was not of uniform quality, and the ingredients mixed with it were not tested before use.

The PSIS team of NPC suggested (a) strict adherence to drawings for the making of patterns; (b) proper facing of moulding boxes, so that two halves of the casting

matched properly; (c) increase in the number of guiding pinholes for moulding to ensure proper alignment; adequate supervision in placement of cores; and (c) a uniform mixture for ingredients.

Transportation of materials adds to the cost of the products, but does not add one iota to its value. The longer the distance traversed, the higher the manufacturing cost, no part of which can be recovered unless you raise the price for the consumer. It might be worthwhile for a small firm to consider buying from a local firm an item priced a rupee more rather than from a distant place where it is priced a rupee less, if the difference in transportation cost is more than a rupee!

Quality Control

A number of small-scale units are dependent on industries engaged in assembling and manufacturing from components supplied by ancillary units. Some may be manufacturing items for consumer use.

Whatever the end use of product manufactured, the quality factor plays an important part not only in increasing the firm's share of the market, but in enabling it to retain and enlarge the share. Small firms are not always equipped with testing and measuring equipment. It might be a good idea for a group of neighbouring small units to use common facilities for Quality Control and Inspection.

It is more necessary for ancillary units to conform to standards, and to assess continually their success in doing so, as large organisations can always go in for producing an item on its own, or sub-contracting the manufacture of the item to another small firm, whereas once a small firm stops receiving orders for the component, it is not in a position to build up a new market quickly.

Cent Percent Indigenous

A Route Relay Interlocking panel, made by the Railways in September 1966, has, for the first time in India, used completely indigenous equipment, except for the plug-in type relays.

This installation at Villivakkam (Madras City) was done by the Railways' own engineers.

A private firm in Coimbatore and the Railway's Signal Workshops at Podanur jointly made the panel, point machines, colour light signals, etc., for this equipment, which is claimed to be as good as any set up anywhere in the world. The panel replaces two cabins of the orthodox mechanical type, and has not merely reduced the number of operating staff, but provided a far quicker and simpler means of setting up routes, thus increasing capacity. It cost Rs. 3.8 lakhs, of which the foreign exchange element was Rs. 75,000.

Every working hour of a machine counts. Every idle hour is paid for in terms of depreciation and overheads, and goes into the manufacturing cost. It is, therefore, most essential for small firms to see that machines and equipment are utilised to capacity. In case they are not utilised to capacity, neighbouring units might pool their resources, or sell or exchange machine-hours by processing each other's work. It would probably be more profitable for a firm to reduce its range of activities rather than keep machines working part time.

Machines and equipment can be effectively utilised only if their productive capacity is increased continually. All users of machines should aim at increasing the

productive capacity of their machines to ensure the production of standard items at reduced cost, reduction of manufacturing time, and ease in assembly. To meet these ends, and to make work safer, it would be necessary to design jigs and fixtures, tools and safety devices for machines.

Ergonomics

The principles of Ergonomics should be applied both within the firm and in the equipment manufactured by it. Ergonomics aims at fitting work and equipment to the worker to enable him to work effectively and comfortably. It also aims at increasing satisfaction at work. The procedure adopted for the application of this technique is to analyse the physical, mental, and perceptual loads on the worker, to find out where the demands on a person's capabilities and endurance exceed his capacity and the facilities provided to him.

As a part of the NPC project (PSIS) in a small firm, described earlier, it was found that the workers engaged in a particular job were sitting in an uncomfortable position, as their machines were placed on the floor. Arrangements were made to place the machines on benches where the eyes of the workers were in line with the jobs on the machines, and unnecessary fatigue and loss of energy due to bending and straining were avoided. The output went up, and the rejection rates were reduced.

Personnel Management

Personnel Management aims at obtaining maximum productivity through better relations between management and labour. A small firm's strength is in the fact that it enjoys direct leadership of the proprietor who is in a position to inspire confidence through personnel guidance and direct supervision. He is also able to honour any commitment made by him as he does

not have to refer to a higher authority or a head office. Although a small firm enjoys these benefits, it cannot reap the best advantage out of this situation, unless it can use the principles of Personnel Management. The management should, therefore, pay attention to recruitment of staff most suited for the job, training of personnel at all levels, maintaining a personal audit system indicating the present position about staff retiring or leaving, and those who can be developed to take their places. The entrepreneur of the small firm should take into account the wage levels of the area in general, and of the skills required in the firm in particular.

Marketing

A great deal of the time of the proprietor of a small firm is spent on finding markets and maintaining them. Perhaps the unit is established because at the time of establishment there was a market for the item proposed to be manufactured. In course of time competitors might come into the field, or the original markets dry up, and, as a result, the entrepreneur spends a great deal of his time looking for new markets. The entrepreneur should, therefore, be continually vigilant about the market, acceptable standards, and the quality of his products.

In this area the author would like to suggest that the feasibility of the Local Productivity Councils acting as information bureaux, and supplying the necessary data about the products of local small industries, could be explored. The small-scale industries would have to become members of LPCs, and probably pay a fee towards the cost of the service. Groups of small industries might also like to subscribe to organisations dealing with marketing of certain products.

Fuel Efficiency

While discussing a cost reduction programme for small-scale industry, one

cannot leave out the cost of services such as steam, fuel, industrial gases, and electricity. In some industries fuel accounts for 10% to 40% of the total cost of manufacture, and any saving in fuel consumption would mean a considerable reduction in manufacturing cost. The NPC established a Fuel Efficiency Service in 1964 to assist industry in adopting proper techniques of fuel and heat utilisation. The Engineers of this service have rendered assistance to a wide range of industries, including cotton textiles, rayon, refractories, paper, and engineering. Their surveys have revealed that major losses in fuel utilisation are effects of minor causes, and rectification

can be effected by simple fuel efficiency techniques. For example, in a textile mill unburnt carbon losses were as high as 50%. This waste was created by unequal spacing of fire bars in the grate. Readjustment of the spacing of fire bars reduced the carbon loss to 15%, resulting in a saving of Rs. 55,000 per year for the mill.

Agencies Rendering Services

A number of agencies are already at work rendering developmental, technical, and managerial advice to small-scale industry. There is a strong case for more

A Man Learns

"Sooner or later, a man, if he is wise, discovers that life is a mixture of good days and bad, victory and defeat, give and take. He learns that it doesn't pay to be a too sensitive soul; that he should let some things go over his head like water off a duck's back.

"He learns that he who loses his temper usually loses out. He learns that all men have burnt toast for breakfast now and then, and that he shouldn't take the other fellow's grouch too seriously. He learns that carrying a chip on his shoulder is the easiest to get into a fight.

"He learns that the quickest way to become unpopular is to carry tales and gossip about others. He learns that buckpassing always turns out to be a boomerang, and that it never pays. He comes to realise that the business could run along perfectly well without him.

"He learns that it doesn't matter so much who gets the credit so long as the business benefits. He learns that everyone is human, and that it does not harm to smile and say 'Good Morning' even if it's raining:

"He learns that most of the other fellows are as ambitious as he is, that they have brains as good or better, and that hard work, not cleverness, is the secret of success. He learns to sympathise with the youngster coming into business.

"He learns that bosses are not monsters, trying to get the last ounce of work out of him for the least amount of pay, but that they are usually pretty good fellows who have succeeded through hard work, and who want to do the right thing. He learns that folks are not any harder to get along with in one place than another, and the 'getting along' depends about 98 per cent on his own behaviour...."

coordination between these agencies, so that the services are effectively utilised.

Besides the officially established agencies, small firms may approach firms of Management Consultants for advice and guidance. NPC's PSIS is intended to render services in the same way as management consultancy firms. With the present limited staff, however, it is not possible for NPC to service industry all over the country. It is, therefore, recommended that a Management Consultant be brought in for brief periods to advise small-scale industries. The engaging of consultants is not very popular with small-scale industries for various reasons. First, and probably the most crucial one, is that their services are costly, and companies are reluctant to meet the cost of an expensive service the results of which they are not sure of. The second inhibiting factor is the feeling that calling in a consultant is tantamount to an admission of gross inefficiency. But, it must be realised that consultants are brought in by

even highly efficient firms. The presence of consultants in a firm is, therefore, by no means a public confession of inefficiency. The outside consultant brings in an objectivity which one cannot always expect to find in the management of a firm. Consultants also have a valuable influence on the critical capacities of the staff, and assist them in looking at their problems afresh.

A consultant may be called in to survey the existing system of controls in a unit, or the methods of fuller utilisation of plant and equipment, to set up systems of cost and budgetary control, to recommend better methods of operation, etc. The final decision on whether the whole or part of the consultant's recommendations will be implemented always rests with the entrepreneur. No consultant can create a business for you, nor can he transform a business overnight. He can only give guidance on how to run it more profitably and effectively. He also brings in an accumulated experience of applying analytical techniques.

Some other agencies, like the Institution of Work Study and the Ergonomics Research Society of India would be in a position to render service to small-scale industries, particularly through intensive training programmes. They would even be prepared to charge concessional rates to small-scale industry for their programmes.

Conclusion

A chart summarising the requirements, problems, and suggested course of action for introducing Productivity Programmes is given at the end of this paper. The list of subject areas could be made longer. An attempt has been made here to highlight only those techniques which would have an immediate impact in contributing to higher productivity in small-scale industry. It will be observed that the lines of demarcation fade when applying specific techniques and

Chemical to Step up Wheat Yield

Cycocel, or triple 'C' in short, has been found to give increased yield of wheat, besides shortening and strengthening the straw.

First developed in the University of Michigan, it has been tested in Britain and the Middle East, and will be manufactured in Britain in 1967 for use in the Commonwealth countries.

Applied at the rate of 1½ lb. to 2½ lb. per acre, this new chemical has given 40 per cent increase in wheat yields.

one specialisation merges into another. Perhaps we may look forward to an integrated approach to the whole problem, and provide the management of small enterprises with comprehensive Productivity Services.

REQUIREMENT	PROBLEMS	SUGGESTED COURSE OF ACTION
I MANAGEMENT DEVELOPMENT	One man has to manage all functions and activities of manager	1) Intensive Course in Work Study 2) Specially designed course on Small Business Management highlighting aspects like Cost and Budgetary Control, Value Analysis, Product Design, Production Planning, Purchasing, and Marketing 3) Special training in Cost and Budgetary Control and Marketing Management 4) Training family members in Cost and Budgetary Control
II COST REDUCTION	Lack of Capital; Difficulties in training	1) Critical Examination of Resources used in Industry (outlined in subsequent rows) 2) Individual - product-profitability analysis
III ECONOMY IN CONSUMPTION OF MATERIALS	Scarcity of materials; High inventory cost; Higher Purchase Cost due to low order quantities Perishability of materials and restricted shelf life of some materials	Application of techniques like: 1) Value Analysis 2) Product Design 3) Packaging 4) Process Planning 5) Variety Reduction 6) Standardisation 7) Product Planning 8) Inventory Control
IV BETTER PROCESS AND PRODUCTION METHODS	Lack of technical know-how	1) 'Make or Buy' analysis 2) Individual - product-profitability analysis 3) Manufacture in part finished state to ensure economic batch lot and finish finally on receipt of order 4) Process Studies 5) Method Study 6) Tool and Jig Design 7) Assistance from Technical Advisory Service

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|---|--|--|
| V BETTER UTILISATION OF EQUIPMENT AND PLANT (space and building) | High cost of capital tied up | 8) Quality Control
9) Ergonomics
1) Utilisation Analysis
2) Use over 2 or 3 shift basis
3) Sub-contract the work when utilisation is very poor
4) Canvass additional work so as to keep machines busy
5) Use machinery on a 'Pool' basis in an industrial establishment
6) Preventive Maintenance
7) Use of Ergonomics |
| VI ECONOMY IN SERVICES (Power, Steam, Gas, Fuel, Industrial Gases etc.) | High cost of operation | 1) Relative Cost Analysis
2) Fuel Efficiency Studies
3) Change the type of process to suit the 'Service' available |
| VII ASSOCIATION OF LABOUR WITH THE PRODUCTIVITY DRIVE | Lack of Motivation; lack of emotional involvement in the Productivity movement | 1) Sharing the Gains of Productivity in terms of hard cash
2) Training for better skills
3) Suggestion Schemes
4) Incentives Schemes, apart from Sharing the Gains of Productivity
5) Use of Ergonomics
6) Better working conditions, environments, amenities, etc. |

Israeli Engineer Evolves Way

The presence of salt in sewage renders it unsuitable for feeding and irrigating crops, so that millions of cubic metres of such sewage, otherwise good enough for agriculture, have to be led into the sea.

According to a report in *The Hindu*, Mr Menahem Rebhun, an Israeli Sanitary Engineer, has found a way out. He has traced the influx of salts into sewage to two sources—industrial plants and certain types of water softeners. He found that by merely separating the industrial waste and spent brines (salt solutions) of softening installations from the municipal sewage systems and by modifying the softening processes, nearly ten million cubic metres of water (353 million cu. ft) could be saved for agricultural use annually in the Haifa system alone. By follow up of Mr Rebhun's findings, the Water Planning for Israel Ltd., is now planning to re-channel the sources of high salt content out of the main sewage systems and preserve the treated sewage for agricultural use.

Gandhiji and Rural Industry

IT WAS EINSTEIN who said that long after Gandhiji had ceased to be, it would be difficult for men to believe that such a man in flesh and blood walked the earth. Nevertheless most intellectual contemporaries regarded his economic technology, albeit somewhat affectionately, as medieval. Surprisingly, it was only Bernard Shaw, who, having discussed with him the Economics of the Spinning Wheel at the time of the Round Table Conference in London, remarked that he found Gandhiji the most clear-headed of men: that when the mass of men had just nothing to do, it appeared plain commonsense that they should spin for themselves, and satisfy at least one of the primary needs of man.

Of course, things have changed and the outward appearances of our times bear no recognisable resemblance to the India of the 'twenties and the 'thirties. Conceived against the Depression Psychology of the Inter-War period, the Village Industries Programme, if it is to be a part of the Dynamics of Social Change, must be thought out afresh in the context of mounting inflation and the accompanying revolutionary changes in the purchasing power and the consumption patterns of large classes of people.

Gandhian Economics

DH BUTANI

Gandhiji himself would have done it. One aspect of his personality has been seriously underestimated: though stubbornly rooted in certain principles, he had a continuously evolving mind; and it's wrong to assume that he uprooted the British Empire by a single technique. Though called by the same name of Satyagraha, there was all the world of difference between non-violent non-cooperation, mass civil disobedience, salt satyagraha, Quit India, and Sarvodaya. These stages really represent the infinite adaptability of the Mahatma's mind to changing political circumstances; and so, in his economics, his mind would have reacted with equal resilience.

It is significant that he readily conceded

the use of power, provided electricity was socially owned and used for the benefit of all. What a remarkable forerunner of the socialists, the Mahatma was. Only on one principle he was not prepared to compromise, namely, that he was never agreeable to any social or economic mechanisms or devices that were to be employed for the benefit of the few only.

It is with his Economics that we are principally concerned; and it is here that we come across that strange phenomenon in historical analysis: the continuous reappraisal and changing appreciation of the philosophical positions taken up by a highly revolutionary mind in respect of the basic facts of life. Political life as we face it now, nationally and internationally, is very much a different cup of tea — or poison — from what it was, when the Mahatma was snatched from us by a cruel act of fate.

In the sea of economic change, however, while the waves on the surface do surely scale new heights of achievement, the basic undercurrent, as Gandhiji felt and understood it, remains the same. In fact, that undercurrent has become more powerful than ever, with a sheer increase in population in one single year being twice or even thrice the entire volume of registered factory employment.

Most economists and sociologists have harped, by now for many decades, on increasing urbanisation as the main feature of socio-economic life in India. This is a 'one-eyed' way of looking at the basic facts of the Indian Economy. Alongside progressive urbanisation, there has gone along, and is going along, at a much faster rate, a progressive ruralisation; and that, in fact, we are having the worst of both the worlds; and further that the solution out of the malaise lies precisely in the adoption of the others and the economics of the Mahatma at a much higher level of intellectual and moral perception, for the complex problems of the nuclear age require a proportionate change of magnitude in application, as com-

pared to the far simpler issues of the Gandhian era, where the morally weakening colonial regimes were fighting a losing battle against resurgent economic and political nationalisms.

The repeated political and economic crises through which this country has been passing since the Chinese aggression require an examination in depth of the fundamental issues involved in finding and working out at the ground level of an employment potential for a population of nearly 500 million growing at the compound rate of nearly 3 per cent per annum. The issues involved are momentous. Do we use them as cannon fodder? Does Large Industry have a potential for absorbing even a fraction of them? Can we without sacrificing the essential elements of Independence obtain foreign economic assistance of a magnitude sufficient to provide these 500 million people with equipment and materials for gainful employment, and the essentials of life, while the people struggle to set themselves up as a large-scale producing community?

Very obviously, the answers to these questions are in the *Categorical Negative*; and if so, Gandhian Economics gets naturally re-installed as the only valid answer to the basic needs of the Indian Economy.

In a way, the very fact that the Government of India has in a very large measure supplemented the industrialisation programme by Small Industry Development, and plans have been drawn up for fairly ambitious schemes of rural industrialisation, shows that we are not far from the right track; and the fact that the Khadi and Village Industries Commission have 'admitted' Power into their Technology proves that true to the tradition of the master, the Gandhian economists have taken cognizance of the wind of change.

It is the purpose of this paper to reinforce these lines of thinking. And these may now be briefly expounded: (1) The Village Industries Programme must, to use current jargon, be self-sustaining and self-

generating, in its own right. Its sponsors must keep clear of the cobwebs of bureaucratism, to make the most productive use of the massive investments Government is making in the line. These are social investments to which the countryside is entitled by the enormity of its dimensions in the country's demography. (2) The research resources must be devoted in equal proportion, for on research would depend the survival and prosperity of rural industry. Gandhiji's *ashramas* were, in reality, humming with these experiments, and his heart was set on making the Charkha the best technological instrument; and he was bent on research on the staple fibre, its spinning characteristics, and the like. Now we must take on this research on a massive scale in every sector of rural industry. (3) Then there is the question of markets and materials. While what is called Small Scale Industry — which is really not essentially different from large-scale industry — is claiming its quota of raw materials, real bonafide rural industry has hardly a share in raw material stocks. It needs have never been properly assessed. This aspect of the matter needs systematic attention.

Rural Markets

Above all, there is the question of markets. Gandhiji thought of developing rural markets as consuming the products of rural industry. As against this, we have had a lopsided development of enormous purchasing power being concentrated in the urban areas, while hundreds of millions of people in the rural areas are only hewers of wood and drawers of water. We need powerful economic policies designed to convert rural areas into regions of high purchasing power. This has social and economic implications which need to be closely examined.

On the other hand, there lies an enormous unexplored field of almost infinite dimension in the area of foreign trade. The fact that the few village industries emporia

in the country are jammed with foreigners indicates the volume of trade that can be possibly developed with countries abroad in these lines. That Gandhiji's handicrafts should offer a solution to the country's serious balance of payments problem is an interesting commentary on its possibilities.

Management Techniques

Finally there is the question of modern management techniques. Probably sufficient research has not yet been done into the management techniques of the Mahatma. He was a born manager of men; and he would never have been averse to the adoption of techniques which would make men work more efficiently and more happily: that is what he longed for. The Khadi & Village Industries Commission should, therefore, make a formidable attempt in adapting and absorbing modern techniques of management into the rural industry sector.

Gandhiji envisaged that the resources of the community should, in the first instance, be mobilised to serve the primary needs of men and women: food and clothing. (How true he has proved to be in respect of food!) Further, additional resources should be devoted to cultural development that would suit the genius of the people. This, however, is in this context, only an *obiter dictum*, but nevertheless of enormous moral significance in the context of the times we live in.

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Trial Survey
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Manpower Use on Building Construction Sites

JS SHARMA
SP SINGH
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*Central Building Research
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THE COST OF construction includes cost of materials and labour, besides overhead costs. The cost of materials depends upon the market conditions which are beyond the control of an individual or an organisation, and thus, in general, has an equal effect on all constructions. Similarly, the overheads depend upon the organisational structure and the duration of the project. Broadly speaking, therefore, the main cost which can be looked into to achieve economy is that of labour. This paper describes a survey carried out on two construction sites—one comprising about 55 residential quarters, and the other a three-storeyed laboratory building—to determine how the workmen are managed, the planning methods adopted and the amount of working and non-working time of both skilled and unskilled workers.

The work on the two sites had been allotted to two contractors on a rate contract basis. The organisational structure on both the sites was almost similar. The contractors themselves exercised control and supervision, and were generally present on the site for most of the working period. The contractor for the residential quarters had employed a retired overseer to supervise and instruct the workers who were all employed on daily wages. The second contractor himself supervised the work, but had employed a labour contractor for executing the brick work, plastering, and flooring. Both the contractors had given a sub-contract for the bar-bending, and had employed one storekeeper and a watchman. Further, it was noticed that the contractors seldom plan for more than a month in advance, and go on making adjustments as the work proceeded. In fact, they did not seem to be very particular for the completion date. The workers were shifted from one work to the other in between without completing the jobs on hand. The layout for storage of different materials was not well-planned, and this

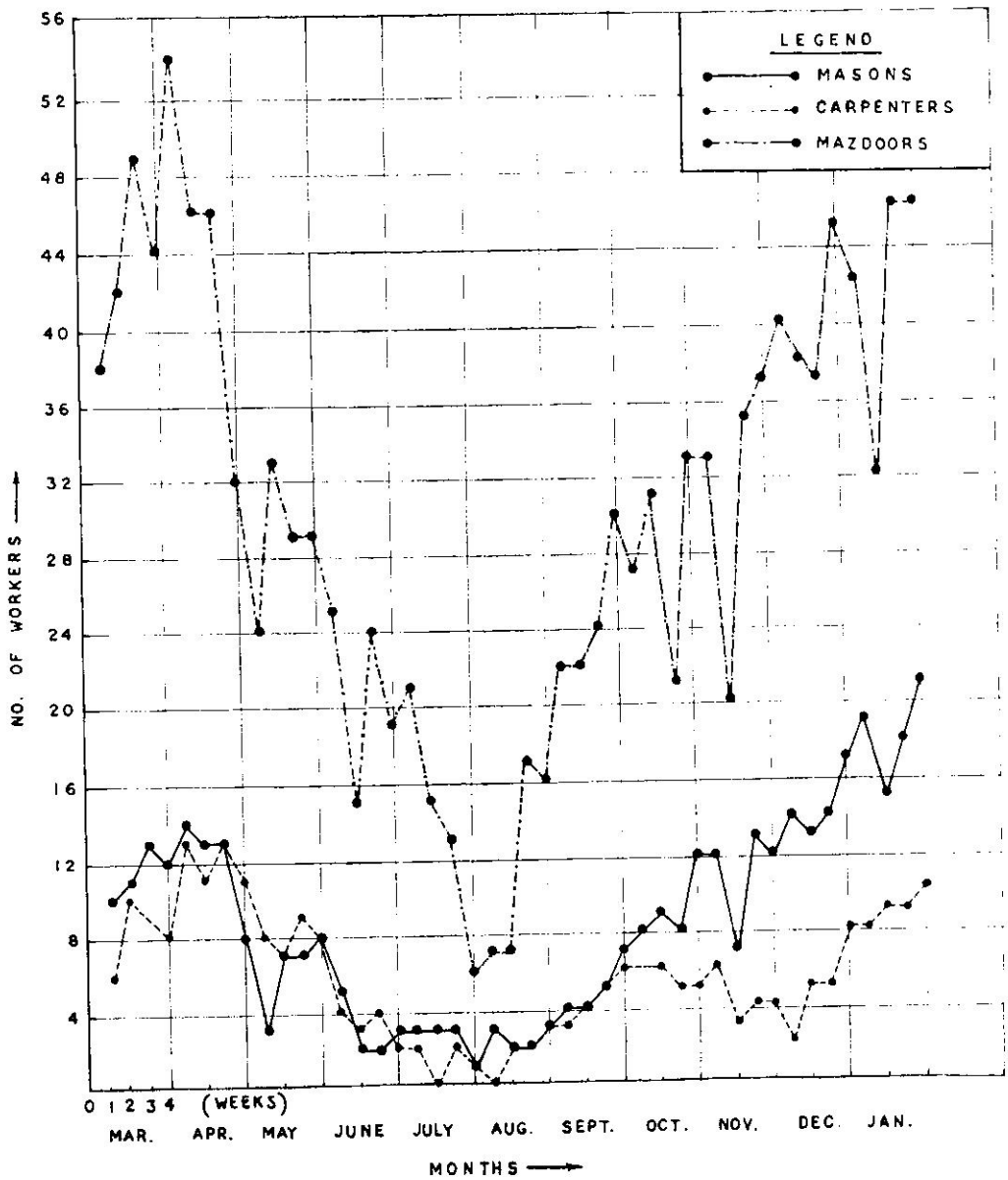


FIG.1 (a). AVERAGE DAILY NUMBER EMPLOYED ON THE RESIDENTIAL QUARTERS SITE

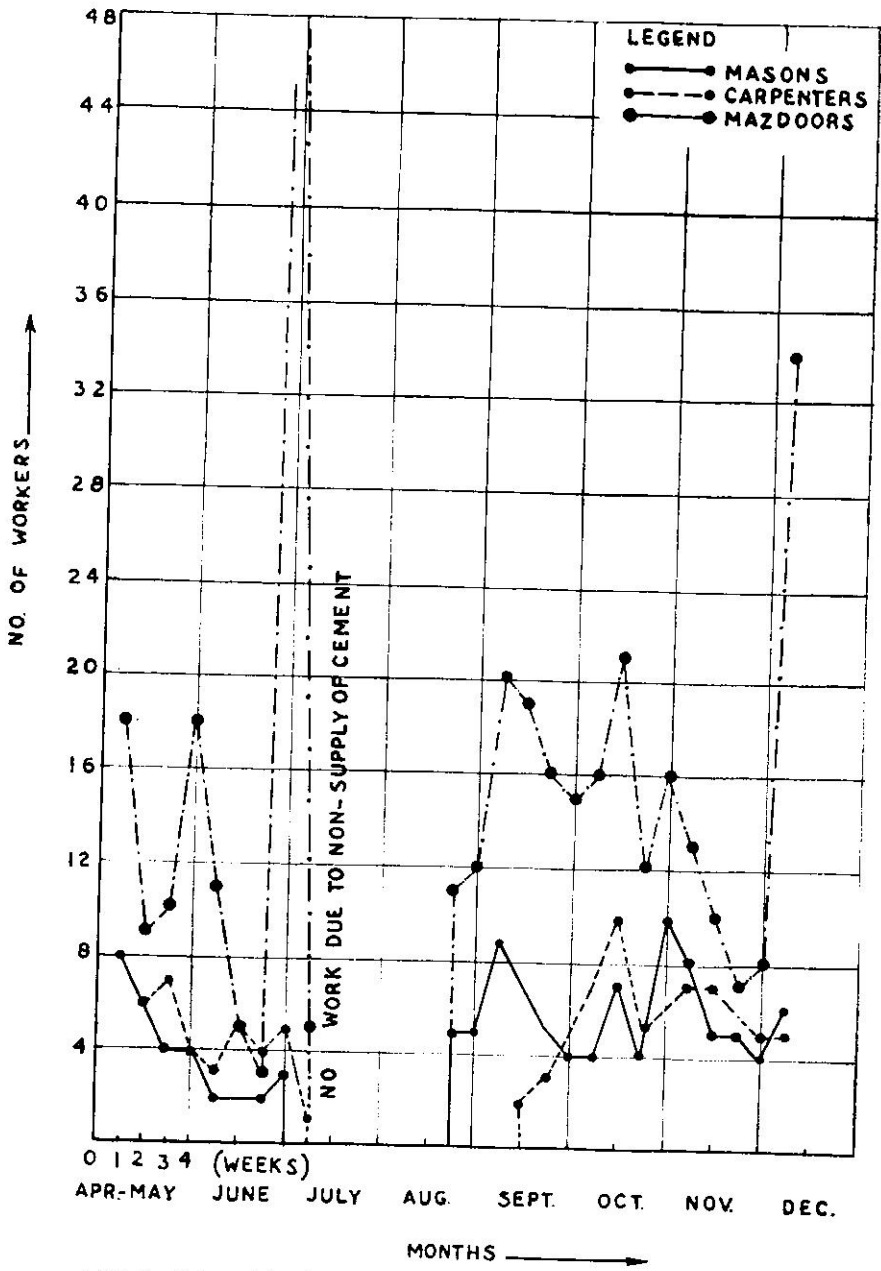


FIG.1 (b) AVERAGE DAILY NUMBER EMPLOYED ON THE LABORATORY BUILDING SITE

resulted in double, and sometimes triple, handling of materials and excessive loads.

To observe the working and non-working time of the workers, the technique of activity sampling was adopted, because a large number of workers performing varied tasks and located over scattered areas—conditions which are typical of construction site operations—could be observed by a very few observers within a designed degree of confidence and accuracy. The time for which the workers were engaged on main works, or did other avoidable works, and the time for which they did not work, were classified as working and non-working time. The non-working time was noted under delay, idle and absent personnel.*

Employment Pattern

The weekwise daily average employment of labour force on the residential building site and the laboratory building is shown in Figs. 1(a) and 1(b) respectively which clearly indicate that there is a great fluctuation in the employment of labour force from day to day. This is attributed to lack of planning, unscheduled and uncertain supply of controlled materials, viz., cement and steel, as well as labour shortage due to seasonal harvesting. It was further observed that the contractors did not care to provide continuous employment to the workers, but often employed

new workers. Thus, a part of their time was often wasted in getting familiar with the work, and during this period their efficiency was lower. Although the contractors had a feeling that, by their policy of employing and discharging workers as and when they desired, they were able to get high output because of fear in workers of losing their jobs if they did not put in their best, in actual practice it was not so. The workers never felt that they were a part and parcel of the organisation, and thus never took full interest in completing the work.

Working & Non-working Time

The time spent in working and non-working on the two sites is given in Table I. This indicates that the utilisation of all categories of workers on the construction of residential buildings site has been better than the laboratory building site although the residential buildings were scattered over a larger area. This may be attributed to better control and greater supervision on the residential buildings, as this contractor had employed one supervisor and a head mason in addition to himself for overall supervision work. Also, construction of the laboratory building, where work progressed vertically rather than horizontally, presented more complications in construction, and congestion in the area, thereby impeding free movement of the workers. From the same table it can be seen that in all the categories of workers, the helpers have been working for a lesser percentage of time than the respective skilled workers. This is mainly due to improper and unbalanced strength of gangs which were provided by the contractors based on their opinion rather than on facts.

The percentage of working and non-working time in morning and afternoon sessions is given in Table II. This shows that all the categories of workers, except carpenters, spent comparatively a greater

*For this study the day was divided into two sessions—morning and afternoon. Four observations on all the skilled workers, and two observations on all the helpers, per session, were taken. The actual time of daily observations was not intimated to the workers and was selected at random so that there could be observations covering all the time. The observations were also started from different points, and different routes were selected for the various readings. As a matter of fact randomness and the elimination of bias were guaranteed by the nature of the building activities which were extensive in size and area. The workers, scattered all over the construction site, were observed by the 'Glance Method'.

MANPOWER UTILISATION

TABLE I
Percentage Working and Non-working Time on the Two Construction Sites

Title of Worker	Working Time %		Non-working Time %	
	Residential Building	Laboratory Building	Residential Building	Laboratory Building
Masons	87.53	78.12	12.47	21.88
Carpenters	82.47	63.81	17.53	36.19
Bar-benders	77.22	72.47	22.78	27.53
Waterman (Bhisti)	78.76	69.03	21.24	30.97
Helpers to Masons	83.58	65.07	16.42	34.93
Helpers to Carpenters	70.10	65.59	29.90	34.41
Helpers to Bar-benders	74.86	67.03	25.14	32.97

TABLE II
Percentage Working and Non-working Time in Morning and Afternoon Sessions

Title of Worker	Working Time %		Non-working Time %	
	Morning Session	Afternoon Session	Morning Session	Afternoon Session
Masons	86.01	82.01	13.99	17.99
Carpenters	71.18	76.92	28.82	23.08
Bar-benders	82.77	70.05	17.23	29.95
Waterman (Bhisti)	79.66	67.00	20.34	33.00
Helpers to Masons	71.95	73.50	28.05	26.50
Helpers to Carpenters	72.96	63.56	27.04	36.44
Helpers to Bar-benders	79.67	68.11	20.33	31.89

percentage of their time working in the morning session than in the afternoon session. In general, it is expected that the workers will spend a greater percentage of their time working in the morning session than in the afternoon session, because they are fresh in the morning, and as time passes they get tired and require more time for rest or to recover from fatigue. However, the percentage of time spent working in the afternoon session is higher in the case of carpenters. This is possibly because they were working under a shed, and because some of their morning time was spent in 'make ready' operations, such as sharpening of tools, and receiving instructions.

Skilled Workers' Time

The percentage of working time of skilled workers is shown in Table III. It is seen that the masons spent the greatest time working, followed by bar benders and carpenters. This pattern can be attributed to the fact that there was one head mason to supervise and guide the work of masons, while the bar benders and carpenters had no maistry.

The other important point depicted in this table is that though all the skilled workers spent quite a high percentage of their time working, the effective time spent on the main job has been lower since they have been doing other jobs which

could have been done by unskilled workers as well. The masons and bar benders spent about 9% of their total time on other jobs, and the carpenters about 8%. The main reason for spending such a high percentage of time on other jobs has been due to lack of control on the unskilled workers. The other reasons have been bad workmanship and wrong work which involved dismantling and rebuilding.

Breakup of Non-working Time

The percentage breakup of the non-working time in different elements is shown in Table IV. This indicates that a greater part of time is spent in delays and remaining idle. Delays may be due to the fault of both the management and the worker, while idleness is due to the worker himself. It is seen that delays are maximum in the case of masons, followed

by carpenters and bar benders. All the drawings were not furnished in advance to the contractor, and there were sometimes delays in supplying the same resulting in holdups, and under-utilisation of labour.

It was observed that there was a lack of supervisory personnel, and that most of the skilled workers being unable to read and understand drawings had to wait for receiving instructions at every stage. Also, there were occasional delays due to the non-supply of materials in time, or waiting for other tradesmen to finish the job. The time spent idling was maximum in the case of bar benders, followed by carpenters and masons.

Non-productive Time

As a matter of fact, the time spent by the skilled workers on other jobs should also be considered as non-productive. The non-productive time in the case of masons, carpenters, and bar benders works out to 24.8%, 33.4% and 32.5% respectively. These are rather high percentages for non-productive time. When a worker is employed on daily wages, he is paid his full wages whether he is productive for greater or lesser time. With a high percentage of non-productive time, the cost of labour increases, and the margin of profit to the contractor decreases. Thus every effort should be made to eliminate or minimise the causes of spending skilled workers'

TABLE III

Percentage Working Time of Skilled Workers: Main and Other Jobs

Title of Worker	Total Percentage Working Time	Percentage Time on Main Jobs	Percentage Time on Other Jobs
Masons	83.89	75.20	8.69
Carpenters	74.40	66.59	7.81
Bar-benders	76.14	67.46	8.68

TABLE IV

Percentage Break-down of the Non-working Time

Title of Worker	Delay	Idle	Personal	Absent	Total Non-working Time
Masons	10.47	2.25	2.47	0.92	16.11
Carpenters	8.10	6.08	5.28	6.14	25.60
Bar-benders	7.85	8.97	4.96	2.08	23.86
Helpers	—	—	—	—	28.25

time on other jobs, and the delays and idle periods.

In general, it has been seen that the average worker was productive for only 70.2% of his time on the job. For the remaining 29.8% of his time he was non-productive, and of this one-third was spent on doing some other work necessary for the productive operations, but which could have been done by unskilled workers, and the remaining two-thirds on totally non-productive operations such as delays.

It may be pointed out that the figures presented in this study are only indications of where inefficiencies may exist and of their magnitude. These may differ from

site to site, and organisation to organisation, but since, in general, for the middle class firms the organisational structure and the working procedures are more or less similar, it can be safely assumed that the pattern may be similar. However, further studies are necessary for more information about the construction practices, methods, policies, and manpower utilisation. In view of the shortage of skilled workers, their increasing wage rates and keen competition, the magnitude of waste or non-utilisation of labour force presents a significant problem in the construction industry which is increasing day by day. Everywhere the demand is for speed in construction owing to rapid industrialisation, urbanisation, and increased standard of living.

Russell Currie Award For Brig. Pennathur

Brig K Pennathur, Executive Director, National Productivity Council, and Chairman, Institution of Work Study, India, has been awarded the Russell Currie Award for Work Study for his "outstanding contribution to the cause of the Work Study Movement in India."

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Brig Pennathur is the first recipient of this award which comprises a Shield and a Medal. He is the founder-Director of the Defence Institute of Work Study.

Recommendations

The following tentative recommendations are made:

1. Endeavour should be made to supply all the drawings preferably at the tender stage, or at the most when the construction starts.
2. There should be proper planning at the job site, indicating the various activities, to avoid interference and congestion. This plan should be displayed on the site, so that the supervisory staff can see to it.
3. A detailed scheduling of materials delivery on the site should be prepared, keeping in view the lead time for procurement.
4. A detailed scheduling of manpower on the job site should be prepared, so that the seasonal harvesting and other local factors can be taken into account.
5. Efforts should be made to have continuous employment for the workers, so that they may achieve higher efficiency.

6. The gang strengths should be provided on a rational basis taking into account the various factors, such as the horizontal and vertical movements involved.
7. There should be adequate supervisory staff. It is seen that provision of head mason, head carpenter, and head bar bender is essential.
8. Introduction of incentive schemes may reduce the cost on supervision, and increase manpower utilisation, but since there are no work standards that have been scientifically fixed, it may not be fruitful. There is, therefore, the need for establishing reliable work standards to begin with.
9. There is lack of skilled workers who can understand and read drawings, and therefore some training facilities should be provided to educate the skilled workers. It is heartening to learn that the Union Ministry of La-

bour has started such training facilities.

But this effort is insignificant in comparison to the vast needs of the country, and, therefore, more facilities should be provided.

Acknowledgements

The authors express their profound gratitude to the Building Contractors for their cooperation in this study, and to the Director, Central Building Research Institute, Roorkee, for permission to publish the results.

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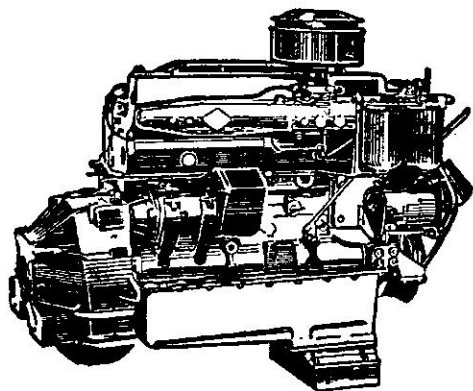
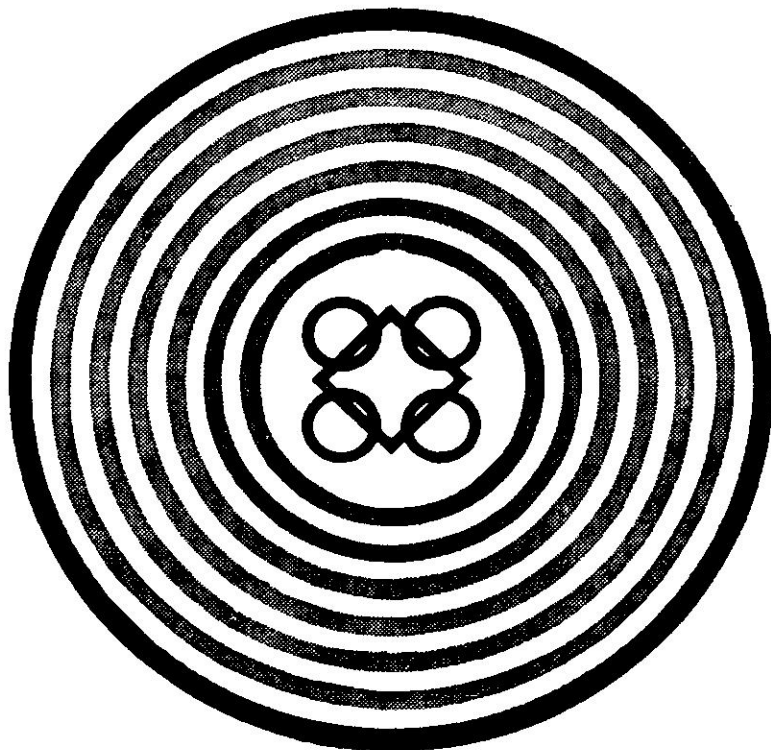
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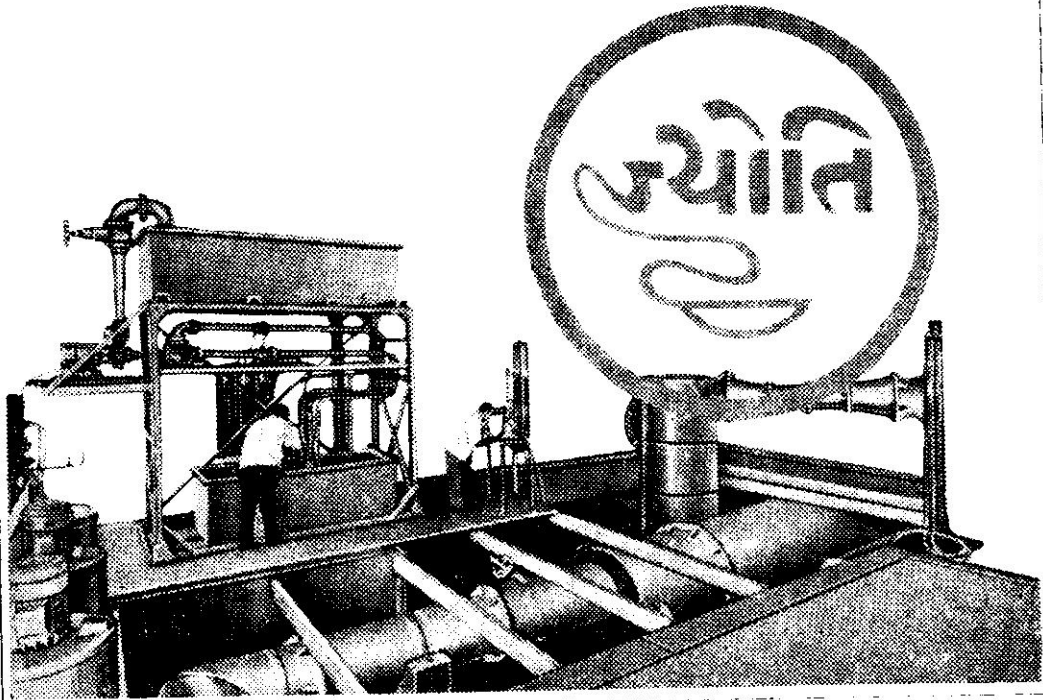


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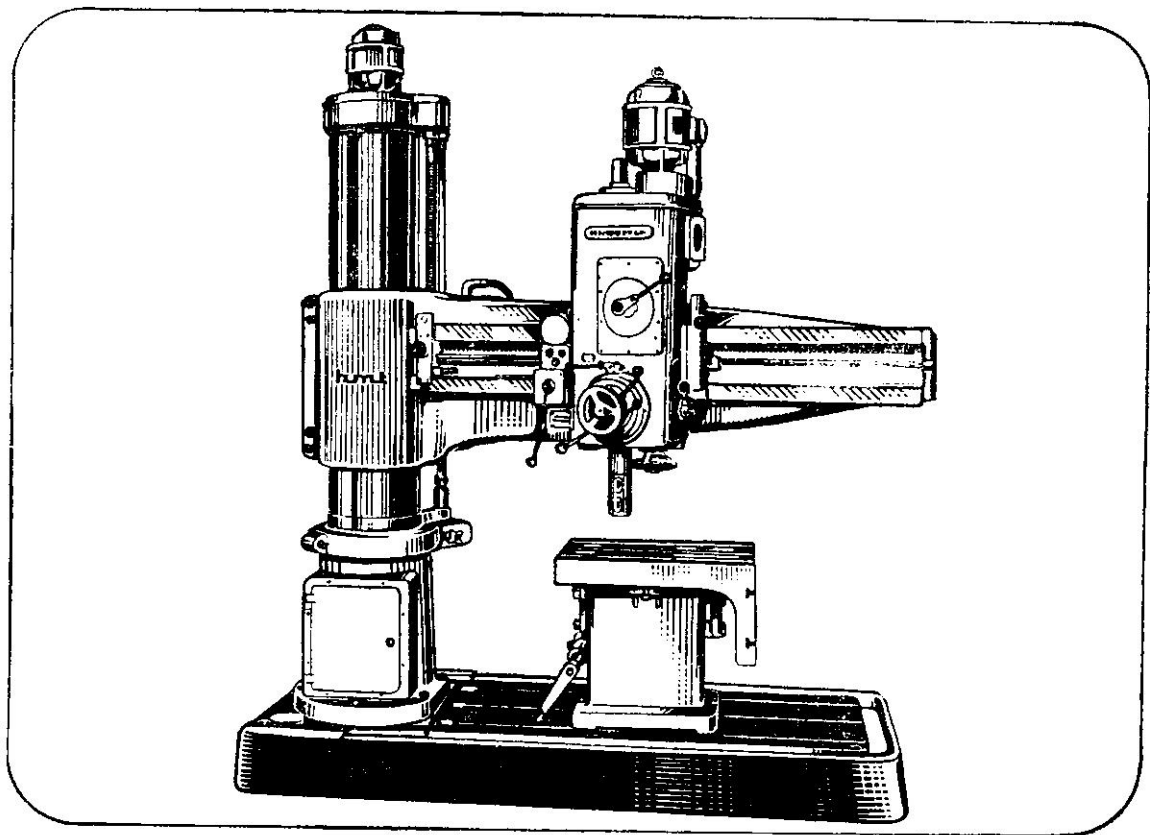
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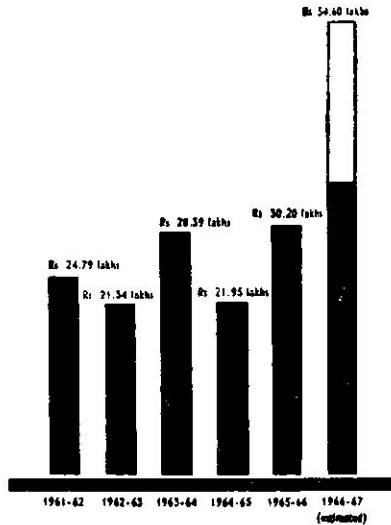
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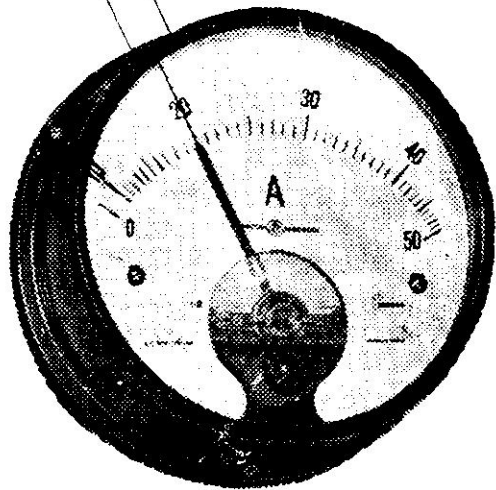
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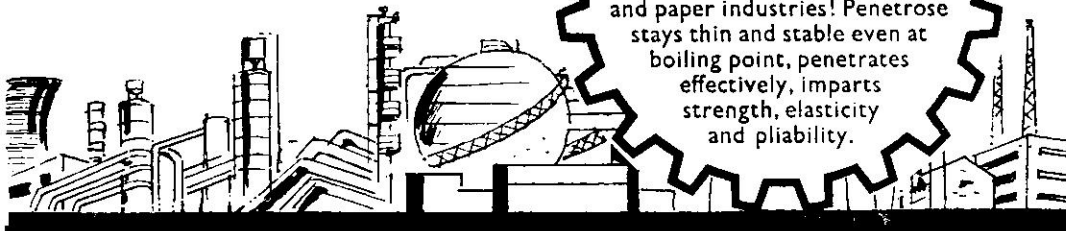
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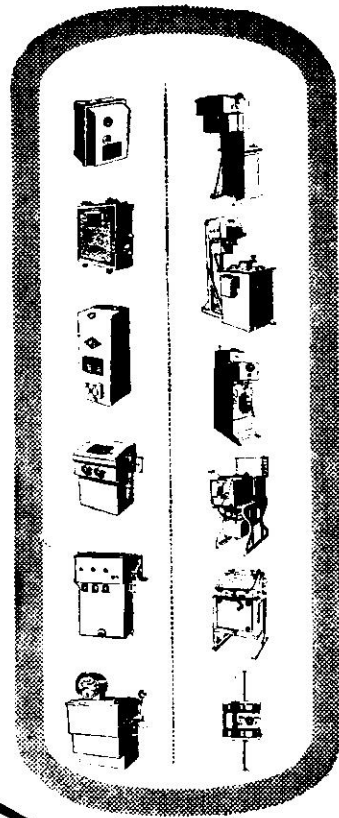
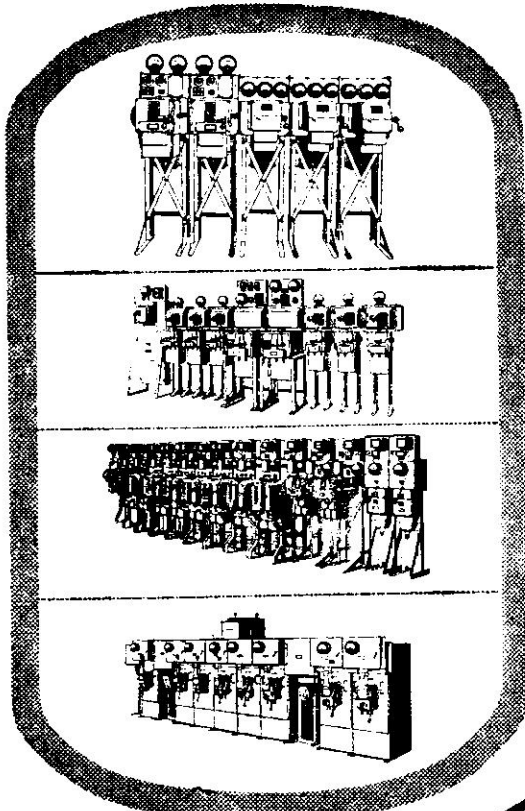


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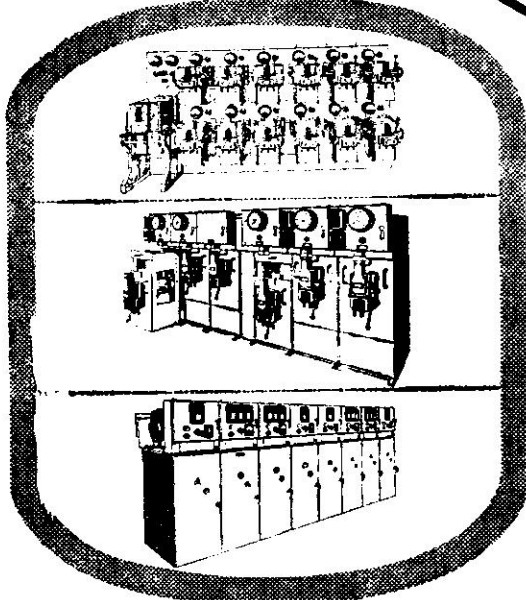
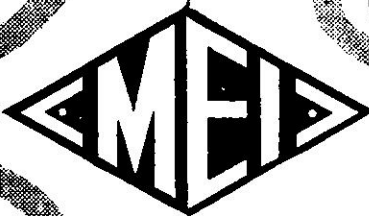
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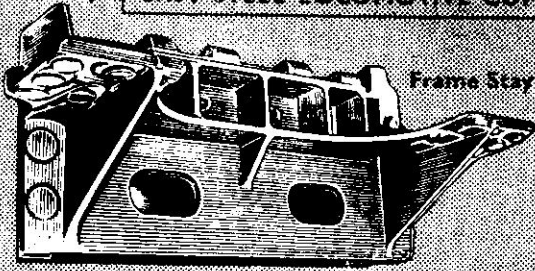
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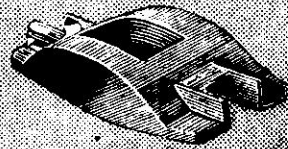
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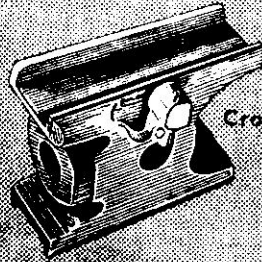
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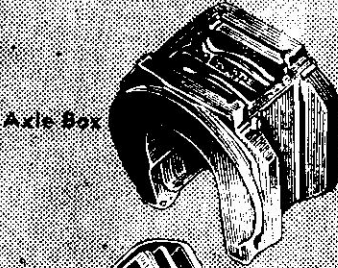
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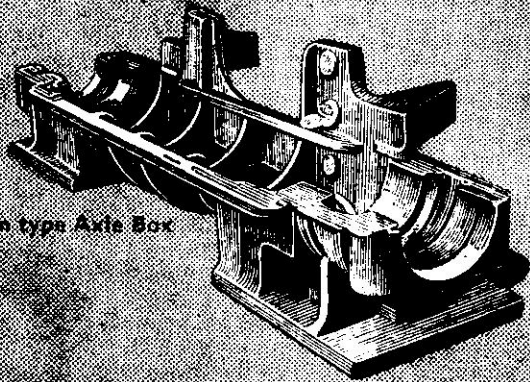
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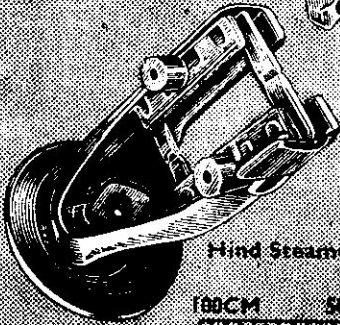
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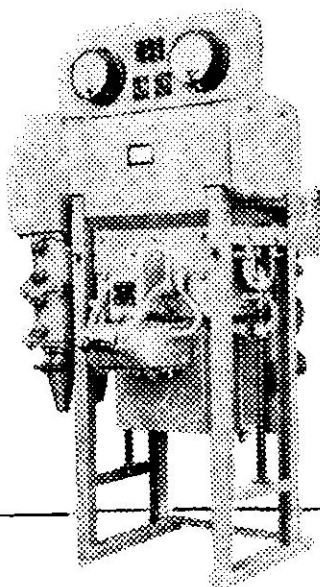
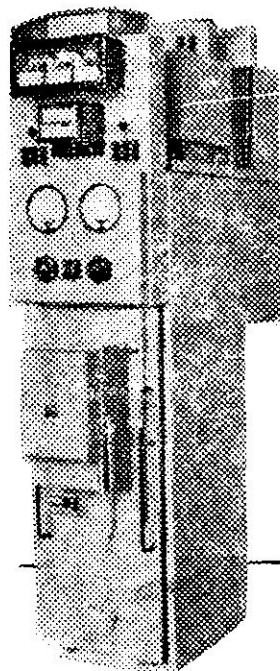
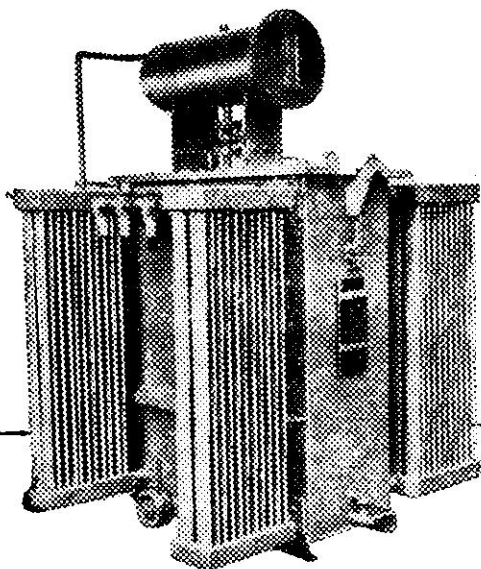
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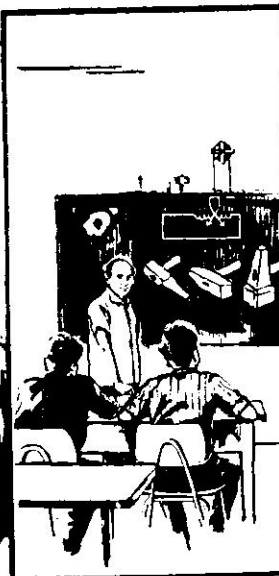
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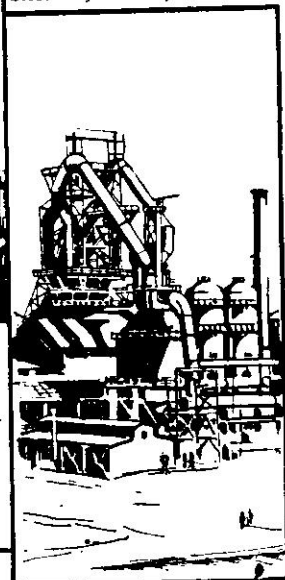
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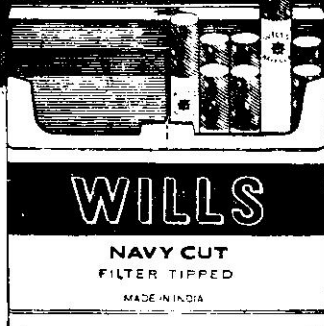


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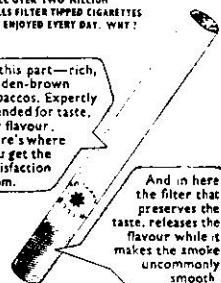


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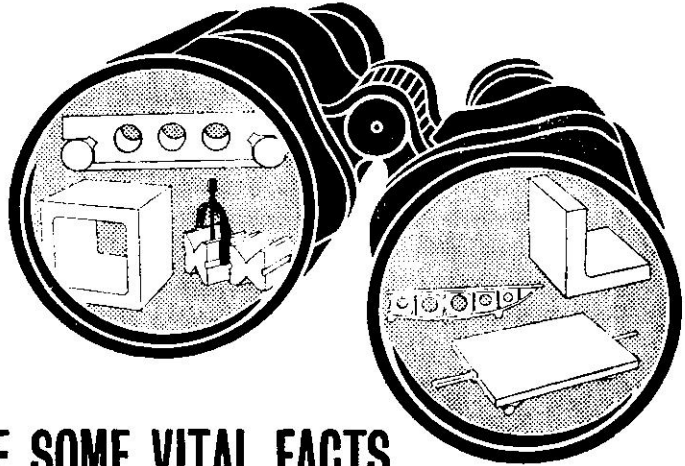
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

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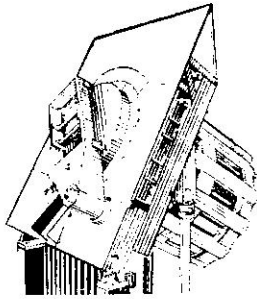
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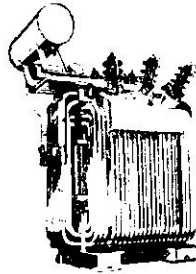
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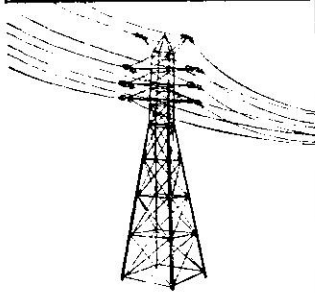
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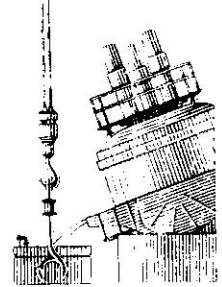


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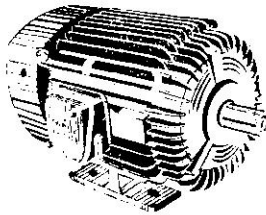


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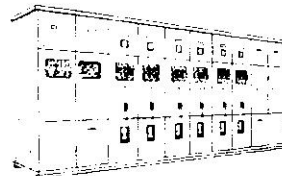
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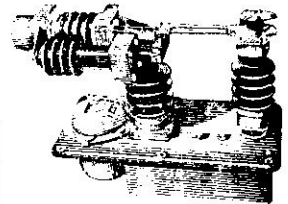
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Batch Production

Group Technology at HMT

TR PATTABHI RAMAN

*Manager, Planning
HMT, Kalamasserry*

A CHARACTERISTIC feature universal to the metal working industry is the manufacture of their products in smaller medium quantities. One would tend to think that this may not be true in technologically advanced countries. It would be surprising to know that even in the USA, 75% of the volume of engineering production consists of batch sizes averaging 25 units or less. The Hindustan Machine Tools Ltd., being a typical metal working complex, is no exception to the above general rule.

Being denied the supreme advantages and higher productivity of mass production, it is the lot of HMT and other small batch production industries to explore other avenues for higher productivity. There appears to be three basic areas for attention.

1. *Revolutionary New Methods of Manufacture:* This involves the application of entirely novel and different production methods and processes, and the replacement of less productive operations by operations ensuring several times higher degree of productivity: for example, the replacement of machining by cutting, grinding, etc., by precision forming, forging or casting. Questions of technological suitability of design, and the use of newer materials have to be answered before adopting these methods.

2. *Use of High Productive Machine Tools and Engineering Methods:* This involves equipment capable of easy and quick setting up, of lengthening the work cycle, and also of the operation of several machines by a single operator. Numerical-controlled and programme-controlled machines are some examples. The larger the size of a batch, the more specialised the production equipment can be, and the higher the productivity.

3. *Use of New Concepts of Production Organisation:* Manifold increase in productivity can be achieved by suitable changes

in the organisation of production, conducive for economic and progressive manufacturing methods. Intensive research by the industry on this last area for increasing productivity in the small lot production has given birth to the concept of Group Technology (GT).

Philosophy of GT

Increasing rate of metal removal by higher cutting speeds, feeds and depths of cut is one potentially great source for increased productivity. Demanding as this proposition is on the design and construction of machine tools, gradual increases in the rigidity of machine tools for the application of high carbon steel, tool steel, high speed steels, carbides, diamond and ceramic tools have reached a stage where further increases in cutting efficiency can no longer be dramatic.

Further, the actual cutting time, especially in small lot production under shop conditions, forms only a small part of the floor-to-floor time, the other components of which have no relation to the higher cutting speeds. Therefore, the overall productivity, due to even, say, a 100% increase in intensity of metal removal, is rather modest. What then are the other factors influencing productivity? Consider the equation:

$$P = \frac{fk.Ck.i}{tk}$$

Where P = a productivity measure

fk = speed/feed rates of work-piece/tool

Ck = degree of continuity of the process

i = number of work pieces in the same set up, and

tk = length of time.

Limited as we are on the speed/feed rates (fk) and its dependent variable tk, it is quite clear that the factors Ck and i are much more effective and holds high potentials for increasing P. It is in this field

that researchers have endeavoured to group together work pieces of similar nature, so that the manufacturing process could have a very high degree of continuity (a machine tool set up for manufacturing two similar shafts successively would have a better continuity factor than if it is set up for a shaft first, and then say, a gear blank) and have large batch sizes artificially created, comprising technologically similar pieces. This way mass production benefits can be got from short-run production. High productive machines could be installed, and high investments in jigs and fixtures justified.

Researchers' Task

The researchers' main task, therefore, has been to answer one or two main questions. Are there clearly established laws in the vast diversity of machinery parts, in their design features, and in their technological parameters? Are such laws, if they do exist, sufficiently clear-cut, and stable, so that the entire production set-up could be geared up to a whole group of technologically similar work pieces? The results of such work have proved convincingly the existence of such "technological classes". Such laws apply naturally only to a certain branch of production characterised by affiliated products, say only machine tools or only locomotives (but not both). In spite of its great variety, components are found to conform to definite pattern of geometric similarity, and/or of similar operation sequences. This important discovery means that it is possible to distribute the high costs of well-adjusted manufacturing processes among a sufficiently large number of workpieces in small lot production, and to achieve higher productivity. This whole body of knowledge on classification of components and their related aspects have come to be known as Group Technology.

In 1959, a specialist team of engineers at HMT, charged with the task of developing an integrated data-processing system,

covering, among others, Production Control, Inventory Control, and Cost Control, underlined the urgent need for streamlining and standardising the numbering system of components which were growing in different patterns depending on each new product family that came into being. Further, even with the help of conventional data-processing systems at that time, the designers and production control staff alike were finding it extremely difficult to correlate different components of same type for better control and fewer design efforts. The idea of developing a comprehensive numbering system, which would take care of atleast 10 to 15 years of the future, was

then mooted, and the enormous task of classification was begun. It was, however, early in 1961 that this idea began to gather momentum quickly, when one of our engineers returned from an advanced study tour of the East European countries. The work done on this subject, particularly by Russia and Czechoslovakia, was very impressive, and work at HMT was started full steam on this project. The HMT management was quick to see the great advantages in regrouping the entire plant and machinery of the then duplicated HMT Bangalore, according to the popularly known "product line" layout, hitherto exclusive only to the mass production industry. By now, group

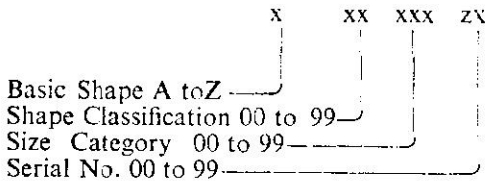
Even Kings Must Be Trained

In the centrepiece of the *New Statesman* (Nov. 11, 1966) Mr Paul Johnson, Editor, has argued strongly for appropriate training of Prince Charles, who attained the age of 18 on Nov. 14. The Editor says: "... This is a matter of considerable public concern. For better or for worse, Britain seems likely to remain a monarchy for the foreseeable future. If we are to have kings, then, it is vital that they get the most suitable education for the job. The monarch still discharges important political responsibilities: not only to warn and encourage the Government in the routine business of legislation and administering, but to act as a constitutional long-stop in moments of crisis... We cannot now foresee what strains our constitutional system will be subjected to in the future; but we can face it with more confidence if we know that the monarch has been well and sensibly educated, and thoroughly trained for the job... It is so important to all of us that the future monarch should have the benefit of a university education..."

Why is a university education so necessary (and by this I don't mean the parody provided for the Duke of Windsor)? First, because in its free, speculative atmosphere he will be brought into contact with the widest possible variety of viewpoints, both among his teachers and his fellow-students, will hear conventional wisdoms challenged and minority cases put. Second, only in a university can he undergo a serious and prolonged course of academic discipline of a kind which will allow him to develop the faculties of analysis and judgment essential to high office..."

technology has become part of HMT's life.

Depending on the particular need, several classification systems have been developed. Some are based on purely geometric similarities, some on sequence of manufacturing operations, or a combination of both. The HMT system envelops both geometric properties and manufacturing sequences. The physical numbering system consists of an alpha-numeric combination of seven digits.



The basic shape classification, designated by an alphabetic letter, is explained by Chart 1. Thus a short workpiece (say $L/D \leq 3$) with an axial opening and without gear-teeth would be classified as B, and one with spur gear-teeth as D, and so on. The next two numeric digits further classify the features, and the next two pinpoint the size category for each one of the three minute classifications of shape. These classifications for the two basic shapes of B and D are given in Chart 2. Such detailed classification is also available for all the other basic shapes.

A further two-digit serial number is given for identifying each individual component falling in each sub-classification. Thus, if we are looking for a short gear with a boss on one side and an internal gear-teeth, outside diameter about 75 mm and an L/D ratio of 0.8, then all the drawings with D 1867 as the first 5 bits would give ALL existing components of this description.

The idea of Group Technology is simple in concept, but enormously complex in practice to require extremely detailed planning and plant reorganisation. Over one year in the preparation, the concept was

modified and remodified several times before it took the final shape in spite of the fast data-processing equipment being made available for the purpose. The system as it is today shows every promise of fulfilling all the requirements envisaged by HMT. This is borne out by the four full years of its operation in the various HMT units. We are also reasonably certain that the framework of this system will remain valid for 10 to 15 years of ever-expanding activities of HMT. One simple support for this presumption is that the classification is so detailed, and thorough, that with more than 25,000 drawings classified, the serial number in any category has not exceeded 15 (most of them less than 5).

Design Effort

With this standardisation, the design effort (in short supply in the country), is minimised to the utmost extent possible. It is hoped that, in future, every 10% to 15% of new components could be chosen from within the existing designs. This has been made possible by systematic and accurate classification and quick retrieval for reference. This standardisation has already resulted in a bulk reduction in variety. In future also, the application of this principle is expected to curb the normal human tendency of proliferation of variety. With the micro-filming facility, in combination with data-processing speeds (aperture cards) to be introduced shortly, the designers would have very rapid access to any information.

Productivity in Manufacture Layouts

With the numbering system as the basis, the entire manufacturing facility at all HMT units has been reorganised into different product groups, mainly into Rounds; Non-rounds; Spindles; Gears; Fasteners; and Structural Components. The traditional arrangements of machine tools according to machine type (like lathes, millers, and grinders) had resulted in a big investment in transport time and equipment, poorly

organised work distribution and operation sequences, and a large amount of capital tied up in partially finished parts lying around the plant waiting to be machined. GT offers excellent solutions to these problems. When similar parts are grouped, the batch size is increased for each set up. Within each line, the continuity factor is also increased to a very large extent. Queues at each machine are minimised, resulting in faster manufacturing cycles.

Effects of Reorganisation

These 'long' runs have permitted semi-automatic high production machines to be installed in each line (fully automatic machines could not be used, and also rapid

change-over and adjustability features must be predominant in the machines chosen since the large size is not made up of identical components but only by similar parts having minor dimensional variances).

GT has also sparked off the development of highly versatile fixtures and holding devices that can be quickly set up, and easily adjusted for similar parts.

The effects of this reorganisation are: (1) Reduction in manufacturing cycle time, (2) More balanced work loads, (3) Utilisation of high production and numerically controlled machines, and (4) An overall development of supervision (not only as turning experts or milling experts). These, in fact, are the ultimate advantages inherent in the GT concept.

Group Machining

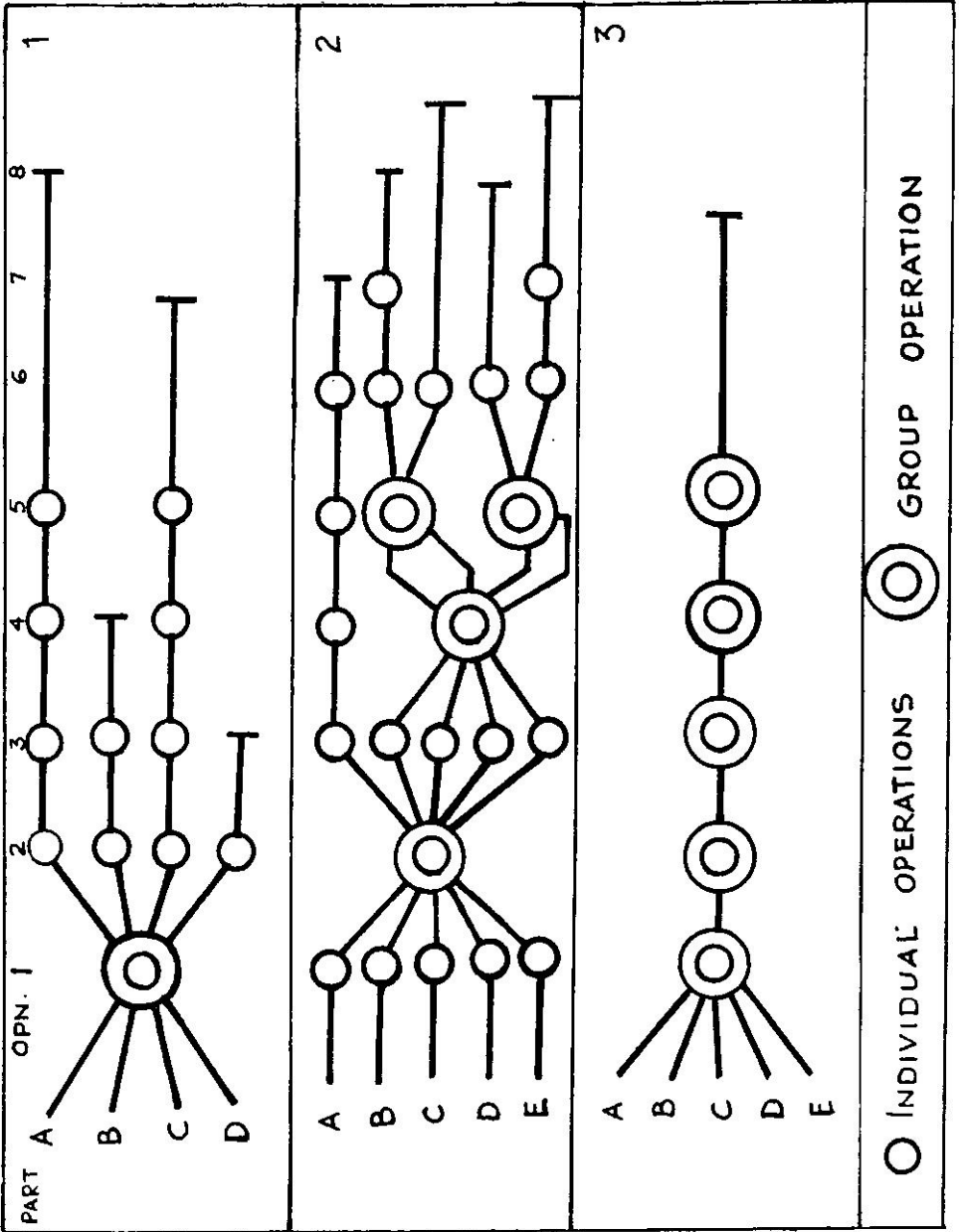
As already mentioned briefly, increasing the batch size artificially is one of the main advantages of GT in production set-ups. One of the elementary things that could be done is to combine several components in the same technological group for the first one or two operations, which are predominantly common between them. Further operations on these different components are carried out as per their individual requirements and sizes. In the second stage, multiple collection and formation into groups in the course of manufacture can be done (see Diagram). This procedure, however, demands much from the operation planning staff, and careful co-ordination and timing from the production control men. Ultimate in this evolution is absolute standardisation of the components, and supreme planning and coordinating effort, resulting in several components being processed throughout in group operations. This is not an utopia or an idle thought, but definitely conceivable, if only it is remembered that group operations are not identical for the different components, but are only operations on the same machine and probably with the same fixtures (ad-

Ten Times Stronger Than Steel

Two London firms have announced plans to produce, on a mass-scale, carbon-fibre material, a revolutionary new synthetic which will be 10 times stronger than steel, says a report in "The Hindu."

The new material, developed by scientists at Britain's Royal Aircraft establishment, Farnborough, may, by 1968, be challenging steel and glass fibre for making aero-engine parts, car bodies, boats, and domestic plastic fittings.

The material consists of long strands of carbon fibres which can be moulded with resins into structures which, experts say, are more rigid than steel.



COMPONENT NUMBERING SYSTEM

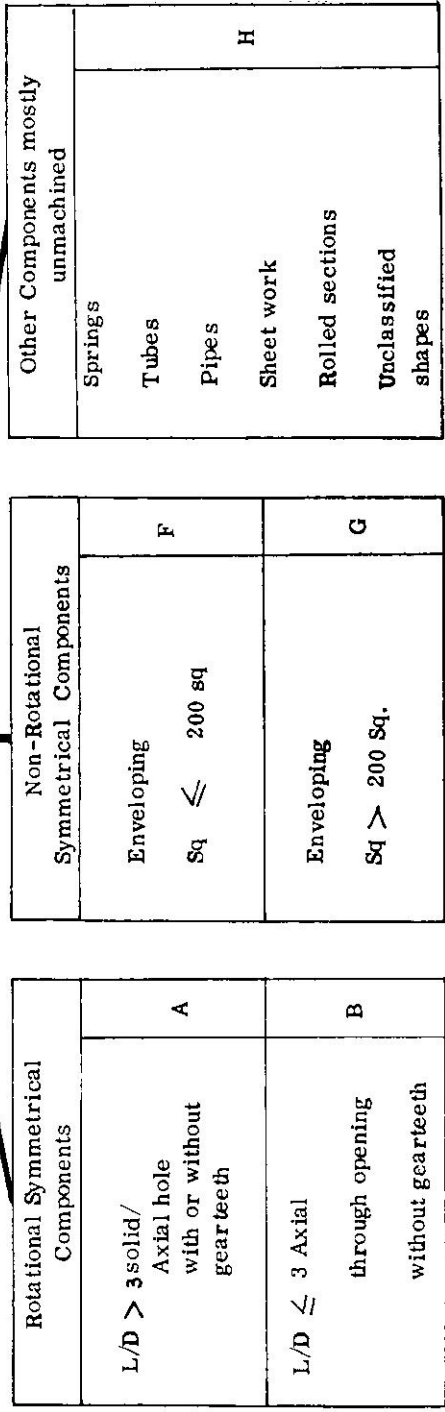


CHART I

B L/D ≤ 3 AXIAL THROUGH OPENING without gear teeth Round/Hex/Sq. sections		
External	No	Internal
Plain/Knurled	0	Hole-Plain/Stepped/ Tapered
Stepped/Tapered + knurled	1	Threads ± 0
0 or 1 + key way	2	Keyway + 0
Threads + other m/cgs.	3	Spl/Pol + 0
0 + Flat/concave m/cgs. on OD	4	1 + Non axial holes
1 + Flat/concave m/cgs. on OD	5	0 + Non axial holes
0 or 1 + Face m/cgs.	6	2 + Non axial holes
Slit Basic shape B + other m/cgs.	7	3 + Non axial holes
Face claws + other m/cgs.	8	Internal serrations + other m/cgs.
Other m/cgs.	9	Other m/cgs.

D L/D ≤ WITH SPUR OR HELICAL GEAR Sprockets & Ratchets TEETH		
External	No	Internal
No boss	0	Hole-plain/stepped
Boss on one side	1	Tapered hole
Boss on both sides	2	0 + key way
1 + key way	3	0 + Spl/Pol
2 + key way	4	1 + key way
Multiple gears + other m/cgs.	5	0 + non axial holes
1 or 2 + Spl/Pol	6	2 + non axial holes
Sprocket wheels and Ratchets + other	7	3 + non axial holes
Gears with face claws ± other M/cgs	8	Internal gear + other m/cgs
Other m/cgs.	9	Other M/cgs

SIZE CATEGORY

Max. OD for round side for square, a/f for hex. sections	No.	L/D RATIO
≤ 12	0	≤ 0.1
> 12 ≤ 20	1	> 0.1 ≤ 0.15
> 20 ≤ 26	2	> 0.15 ≤ 0.2
> 26 ≤ 35	3	> 0.2 ≤ 0.3
> 35 ≤ 48	4	> 0.3 ≤ 0.4
> 48 ≤ 63	5	> 0.4 ≤ 0.5
> 63 ≤ 80	6	> 0.5 ≤ 0.7
> 80 ≤ 125	7	> 0.7 ≤ 1.0
> 125 ≤ 200	8	> 1.0 ≤ 2.0
> 200	9	> 2.0

Examples:

B 23 41 03
D 19 55 01

CHART-2

justable if necessary) and tools (with interchangeable tool set-ups if possible) requiring minor adjustments for each component.

Operation sequence planning and estimating have been considerably simplified. Ready reckoners have been developed for each class, and as the planning and estimating effort becomes more and more standardised, it is becoming more of a routine than "individual originalities".

Effective Production Control

Dissociating the production control staff from exerting their energies in "chasing a diverse group of components, and those required for particular assemblies" had always been a problem. With the introduction of GT, they now look at the total requirement of each component independently, and take appropriate action based on priorities.

They have a limited range of similar components to chase.

Simplified Tool Design

Tool design efforts are also considerably eased, since jigs/fixtures of similar components are more easily accessible for reference and adaptation.

GT is a new concept. Like all new concepts, it requires an enormous effort to rally the acceptance that it deserves. Even with so many overwhelming advantages, it has taken a lot of patient and concerted work to install the system in HMT. But then, major technological breakthroughs like this demand the patronage of the management and the acceptance of the operating personnel alike, and also demand a great amount of work in return for higher productivity, which is the basic quest of not only every concern, but of our whole nation.

An NPC Publication

DEVELOPMENT OF TRAINING EXECUTIVES

This Manual, prepared by Dr M Yoga and Mr Wilbur G Eklund, is intended as an aid to persons engaged in organising and conducting various types of training programmes for different levels of personnel such as technical, supervisory, and managerial.

Price Rs. 7.50

NATIONAL PRODUCTIVITY COUNCIL

38 Golf Links, New Delhi-3

Work Study at Indian

Explosives

and use waste jute strings from another Section for tying the coils. The result?

Savings on packing materials:	Rs. 73,000/year
Savings on labour cost:	Rs. 4,000/year
Increase in capacity:	11%

One Work Study Officer spent two weeks on this investigation which resulted in the above savings.

Overhauling of Rail Tankers

A fleet of 12 tankers used to be overhauled, at the rate of one tanker per month, with the result that one tanker was always under maintenance. After a method study of this operation, the period of overhaul per tanker was reduced from 30 days to only 9 days.

ASOKE GUPTA

*Work Study Manager
Indian Explosives Ltd., Gomia*

Coiling of Wires

There was a bottleneck in the coiling stage of the manufacture of a product: Management requested a method study. Critical examination revealed that one complete task in this operation was superfluous. Elimination of this meant—

- Removal of the bottleneck.
- Reduction of the team size from 7 men to 5 men,
- Increase in output by 50%.

Packing of Coils

THE EXISTING method of packing coils involved considerable use of cardboard ends, labels, side strips, etc. Method Study was undertaken to reduce the cost of packing.

The present method and grouping of activities were critically examined. In the new method developed, it was possible to eliminate the use of end discs totally, reduce the consumption of other materials,

Layout Study

The aim of layout study is to determine the most effective arrangement of specified equipment for specified activities.

In analysing problems on layout, both the vertical and horizontal arrangements of equipment are considered. For each of these,

- (i) 'Movement analysis table' is prepared, giving the movement of material in the plant;

- (ii) 'Arrangement table' is made to indicate the required or preferred position of each equipment in relation to the other; and
- (iii) 'Movement chains' are drawn to show diagrammatically the degree of linkage between units and to resolve inconsistencies.

Based on these, the schematic vertical and horizontal arrangements are drawn.

Different cost factors, e.g. cost of capital per unit of time, cost of operation per unit of time, and cost of maintenance per unit of time, are taken into account.

The most effective layout is a compromise between the vertical and horizontal arrangements, the consideration of cost playing an important role.

It is, of course, presumed that before undertaking a layout study, the methods of working have been investigated, and decisions regarding them taken.

Case Examples

1. *Layout for Wire Packing*: The sales forecast of a large increase in the demand for a product necessitated an increase in the storage space from 1500 to 3400 cases.

In dealing with the problem, statutory restrictions had to be taken into account, and a particular building had to be specified.

Careful examination of the facts, with the use of string diagrams, templates etc., enabled a suitable layout to be developed.

The results achieved are given in Table I.

2. *Changing & Washing Rooms for Process Operators*: The existing facilities were designed for a labour strength of about 450 workers. Management anticipated an increase of 90% in the labour strength in the near future. A layout study revealed that the existing building can be more effectively used to provide facilities for a strength up to 900 at an additional cost of about Rs. 10,000. This has resulted in a saving of nearly Rs. 1,00,000 (one lakh) in capital expenditure.

Planning Study

Planning is the determination of a sequence for a variety of similar and dissimilar activities to achieve an objective in the most economic way.

Among the planning techniques, the two new developments are Critical Path Scheduling and PERT (Programme Evaluation Review technique). The two are basically the same except that PERT has more refinements in it. The technique, based on network analysis, provides a graphic means of showing inter-relationship of various activities within a job, simultaneously highlighting activities which are critical for controlling overall job durations.

This technique has been applied for all types of work involving a large number of constituent jobs of a complex and interdependent nature like—

Maintenance,
Project Development,
Construction, and
Product Development.

TABLE I

	No. of Cases Stored	Space Occupied	Cost of Building	Movement of Materials
Before Work Study	1500	5800 sq. ft	35000	170 ft/Case
Estimated Increase	3400	12600 "	80000	—
After Work Study	3400	7450 "	45000	56 ft/Case
Benefits	Increase 125%	Increase 28%	Increase 30%	Reduction 65%
				Eqv. to 2.5 miles/day

The basic procedure consists of preparing a list of the constituent jobs with estimates of the time required for the completion of each, and then establishing the CRITICAL PATH within this network. This path defines the minimum time required for the completion of the project, gives clear priorities to the jobs, and provides a firm basis for progressing and timely corrective action.

The application of CPS has yielded substantial savings in a number of projects. It has ensured the completion of the project, not only in the shortest possible time, but also in the most economical manner.

Work Measurement

Work Measurement is the method of determining the amount of human work in a specified task, and the proper time to be allowed for doing the task effectively. This concept of time is of the utmost importance in the effective application of all the other techniques of Work Study. For example, in a critical examination, the best among the alternatives cannot be chosen without a knowledge of the time factor involved. This time is made up of 'time for activity' and 'time for relaxation'. The actual time for activity required by an operator depends on his activity rate. Between the very high and the low, there is an activity rate for the average man which gives the least total time. This is termed as the Standard Activity Rate, and corresponds to a rate of working termed as 100 Work Units per hour.

To determine the 'time for activity' or the Basic Time the general procedure is to:

- (a) specify the tasks as regards quantity and quality of materials and products, type condition and layout of equipment, method of working, etc.;
- (b) divide the task into small elements of work; and

- (c) determine the Basic Time for each element.

Of all the techniques available for determining Basic Time, Time Study is the most popular. The actual time for an element is recorded by a Stop Watch with the on-the-spot assessment of activity rate. (Basic Time = actual time x rate of working). A large number of observations are made by different observers on different operators at different times. The resulting Basic Time is calculated as an average of the observations after statistical analysis.

The Basic Time of an element can be compiled also by synthesis from Elemental Data. The technique available for this is known as PMTS (Predetermined Motion Time Standard) which analyses any manual operation into the basic motions required to perform it, and assigns to each motion a predetermined time, which has been determined by the nature of the motion and the conditions under which it is made. This method is quite useful for establishing times for planning and production control purposes particularly in the circumstances where Stop Watch time study is not feasible.

Yet another technique is Rated Activity Sampling based on statistical principles. In this, a number of spot observations, corresponding to the required confidence limit are made, and the timing of these observations are selected at random. The activity rate is also noted during observation. An estimate of the Basic Time is determined from the random observations. This technique is particularly suited to plants or departments where a number of heterogeneous operations are taking place, and especially if team working is involved, e.g., stores and warehouses.

Once the Basic Time is determined, Relaxation Allowance is calculated depending on the load handled, working positions, and working conditions. The addition of

the two gives the Standard Working Time used in all applications of Work Study.

Work Reward Schemes

Work Reward Schemes provide a direct financial incentive for a worker to do his best. The monetary reward is systematically related to the quantity and the rate at which measured human work has been done effectively by individuals or groups in a given period.

The measurement of the quantity of human work in a job has been discussed earlier under the heading of Work Measurement. This is expressed in terms of Work Units, and is accurately determined for each task prior to the introduction of Work Reward Schemes. The total work done by an individual or a team over a period can then be computed in terms of Work Units.

The rate of working is defined as the number of Work Units done per hour of working time. If we take representative groups of workers (considered suitable and sufficiently trained for the job) their rates of working (when they are doing their best without undue fatigue) has been found to range between 75 and 125 WU/hour, with 100 WU/hr. as the mean. This average value is termed as the **STANDARD RATE OF WORKING**.

It also follows, from the above, that any man, who is suitable for the job and trained in it, should be able to achieve a rate of working of 75 WU/hr without undue fatigue. This is called the **MINIMUM ACCEPTABLE RATE OF WORKING**. If workers are prepared, and are able to work at rates more than 75 WU/hour, they are eligible for additional financial reward to encourage them to achieve the Standard Rate of Working.

The difference between 75 & 100 WU/hr. i.e. 25, being equal to 1/3rd of 75

WU/hr, it is only natural that the equitable additional reward for working at 100 WU/hr should also be 1/3 the normal hourly wages rate for the job.

Our management does not want to encourage its workers to work unduly hard to the detriment of their health, nor does it want any deterioration in the quality of product or workmanship. Hence Work Reward is not paid at rates higher than 33-1/3%. This reward is calculated weekly for the operator's working hours on measured work.

These principles are the foundation on which Work Reward Schemes are based. Within this framework there are different types of schemes tailored to meet special requirements. One such scheme is called the Multifactor Work Reward Scheme, developed for the continuous running of chemical plants. In these plants the physical work contribution of the operator is low and he does not have a direct control on the output. Yet an incentive can still be offered to the operators to operate the plants concerned at maximum efficiency. Work Reward, under the Multifactor Scheme, is partly related to the measured work, and partly to a number of factors by scales laid down by the management. Examples of such factors are: raw material efficiency, purity of product, cleanliness and safety, use of steam, power, other services etc.—all to the extent they are within the operator's control. The result of these MF Schemes has been to encourage the intelligent application of operating instructions and the taking of steps to minimise contingencies and breakdowns which would adversely affect efficiency and production.

Work Reward Schemes provide management with an opportunity to show immediate appreciation, in a practical way, of the workers' efforts. The additional reward is clearly within the reach of the

worker, and it depends entirely on his own efforts. Once the workers have accepted the Work Reward Scheme, there is a significant change in the job of Management, particularly of supervision. The Supervisor no longer has to drive his men. They are anxious to do their best, and it is his duty to help them by organising and planning the flow of work to minimise waiting time and also look for method improvements which will reduce "unavoidable" delays. It is also very essential to ensure quality of product and workmanship.

Work Reward Schemes are no substitute for good management. But with good management and good labour relationship Work Reward Schemes provide a sound basis for high productivity. A few case examples are given as illustrations in Table II.

Conclusion

To say the least, Work Study gives one the happy feeling of possession of a tool which can help verify the healthiness or otherwise of the state of affairs of a factory, plant or business.

It must be accepted that its adoption must have the full drive of the senior management behind it. Management should be quite sure that they understand the need of Work Study and have a clear idea of the services it can provide within the management framework. Work Study cannot be expected to perform miracles.

Yet, Work Study has travelled a long way from its first beginnings in studies of men at workbenches. Its scope has widened to include all aspects of work. Its potential today is really enormous and not confined merely to incentive schemes.

TABLE II
Effect of Work Reward Schemes—Case Examples

Examples	Increase in Output per Machine	Increase in Output per Man	Increase in Earning per Man	Decrease in Direct Labour Cost	Saving in Capital
1. Spiral Coiling of wires	33%	76%	25%	27%	33%
2. Printing Machine	100%	100%	29%	35%	43%
3. Case Marking	50%	70%	25%	25%	54%

Read

Hindi Edition of

About Productivity

By Brig. K. Pennathur

Price Re. 1

An NPC Publication

IN THE COMPLEXITY of modern business operations and competitive market economy, it is necessary to minimise the productive inputs, and to maximise the resultant outputs. A company then can hopefully utilise its resources in the most productive manner, economising where necessary, and expending where deemed beneficial. This Input-Output Process is true of all characterisations, departments, and divisions of the company. Moreover, it can be applied, with equal advantages, to all the functions of an organisation, like finance, personnel, marketing, research and development, and production.

This all-inclusive aspect of the Input-Output Process gives to it its modern applicability, across the cross-cultural horizons

tive analysis, each problem can be broken down to its major reasons or rationale for existence — the environment or the organisation where the problem is manifesting itself, and, finally, the outcome of the problem, if left alone, or if subjected to a number of different alternative courses, of corrective action. In this way, a triangular frame of reference emerges, which is:

Problem Rationale

Environment

Decision Outcome

One can further refine this idea by stating that each problematic input requires a processing agent to transform it into decision outputs. The inflow of input factors into output factors requires the agility, competence, and judgment of a sound processing

A Tool for Indian Management

Organisational Engineering Through Systems Analysis

NARENDRA K SETHI

*Assistant Professor of Management
Long Island University*

of international management, making it meaningful in the context of the developing managerialism in India. An effort is made here to examine the major constituents of this Systems-Process, evaluate its functions, relate it to practical business problems, and finally present a conceptual frame of reference for its operations in India. Systems-analysis, in its essential features, is a frame of reference for managerial decision-making and problem-solving. In percep-

agent, who can either be a well-trained and experienced managerial personnel, or a computerised-programmed machine. Whoever performs the processing functions must be fully conversant with both the input factors as well as the surrounding organisation and/or the environment outside.

The process lends itself well both with reference to prognostic and diagnostic solution of the problematic area. This

process may take the following three major steps:

- Problem Recognition**
- Problem Identification**
- Problem Solution**

The initial resistance is at the level of recognising whether or not there is a problem to begin with. This resistance assumes its most emphatic attitude at the level of the top management, because of an innate fear on their part to equate the existence of a problem with personal executive inability or incompetence. Unless this resistance is broken by psychological and communicational tools, the systems process cannot be fully applicable. Secondly, after the existence of some problem is accepted by the top levels of the management, the immediate area of the systems processor is to try to isolate the problem. This is possibly the most difficult of all systems-assignments, because it is at this level that the process begins to move from the traditional administrative practices to the more enlightened information-centred methods, from qualitative to more quantifiable areas and/or factors. Finally, at the third stage, the systems analyst begins to break the problem from its "total" contents to more manageable sub-systems, and presents alternative action-centres with which to weigh the problem.

The Input-Output Process exposes the management to both the immediate short-range and the future long-range repercussions for their actions and decisions. To minimise the possibilities of subjective and man-promoted errors in the decision-process, it is usually considered necessary to think creatively before the decision has been finally accepted. By creative thinking, we mean that the problem-area should be investigated in total, broken down into smaller segments which can be assigned numerical values, and relationships be developed which can present the total, and the segmented perspectives. Newer techniques of CPM (Critical Path

Method), PERT (Programme Evaluation Review Technique), OR (Operations Research), and a number of highly mathematical tools, like Queuing Theory, Business Gaming, and Linear Programming, have been developed over the years which can help the systems engineer in sharpening his creativity. In its managerial implications, one can state the following major elements in this process of establishing meaningful relationships:

- HYPOTHESIS DETERMINATION**
- CONSTANCE AND VARIANCE DETERMINATION**
- FUNCTIONAL RELATIONSHIP DETERMINATION**
- ENVIRONMENTAL FUTURITY DETERMINATION**
- MANAGERIAL ANALYSIS DETERMINATION**

It is the hypothesis which presents the systems engineer with a predetermined and defined way of looking at the problem. It also equips him with a proper analytical tool with which to examine the relevance of the situation. The constants and variables are the components of any given problem. The constants are beyond human or non-human control; the variables are subject to some controlling agency. Each problem-area consists of both these aspects, and the greater complexity an area has, the greater will be the probability of having a far greater number of both constants and variables. The functional relationship determines the pattern of mutuality between the constants and the variables, as without a functional equation between them, the problem just cannot be defined or isolated. In the environmental futurity, we include the outside elements of the society, government, public relations, corporate image, and general economic trends. Finally, it is the systems engineer's responsibility to try and integrate all these aforementioned factors in a valid theory or statement of action, which the top levels of administrative management can then

transform into positive actions and/or decisions.

Information Technology

The whole new idea of systems-analysis is emphatically geared towards Information Theory in general. The assumption is that the complexity of modern business practice makes it quite mandatory on the part of the executive to know, as much as possible, about the problem area, without wasting any unnecessary time in superficialities or peripheral data, and, at the same time, not missing a single thing of relevance to the situation. This, indeed, becomes a monumental task, and the question arises about the various ways of accomplishing the objective. The managerial developments in the late 'fifties and the early 'sixties have clearly opened a new field in the area of information storage, information retrieval, and information processing for the modern busy executive. A human system has to adapt itself to the changing needs and demands put by this premium on information, and its timely and speedy availability. The whole field of current decision-making is totally dependent on information technology, and its multi-dimensional behavioural characteristics are now completely beyond the mental horizons of any individual.

It then becomes the task of the systems engineer to (1) plan, (2) design, and (3) motivate an Information System, for the company in question. The system should be specifically suited to the requirements, both current and projected, and should carefully consider the typical operative functions of the company. It should be noted that there is no such thing as a universally ideal design of Information System for all companies. Before designing the system, we should carefully ask the following:

1. *The Organisational Framework of the Company:*

- A. The geographical and functional distance among people.

- B. The degree of centralised control.
- C. The use of staff specialists or line generalists.
- D. The frequency with which the particular type of information is desired, and at what times, by what people, and where.

2. *The Control Mechanism of the Company:*

- A. The degree of crucial decision-making required for both daily operational work as well as policy-setting work.
- B. Can the variables in the decision-process be quantified?
- C. Monetary implications for setting up a computerised centre.
- D. The total personnel cost and pay-off period cost for the systems-plan.

3. *The Cultural Dimension of the Company:*

- A. The level of resistance at the managerial levels.
- B. The use of traditional *versus* systems concepts in the present administration.
- C. The socio-economic and cultural acceptances of both the top management and junior level of administrative employees, who will process the information for the chief executives.

These are only a few suggested pointers aimed at exposing the myth of the total information system. The answers to some of these questions, and others, will direct the systems designer to initiate and activate a particularised form of information control system, aimed at using the resources of the company to their most advantageous structures, and sustaining the

systems structure both for the present needs as well as for the projected expansion of the company in the coming years. It will aim at flexibility of execution and adaptability to the environment in order to control the human problems which often accompany the design in its most elemental and introductory aspects.

Adaptability in India

We have briefly conceptualised the major action-centres and decision-elements required in systems-control, and the input-output principles therein. In the context of a developing managerial perspective in India, the aforesaid systems engineering can be purposefully utilised to improve the productivity and profitability of the industrial operations, to shorten the time-lag involved in most production and control decisions, to improve the information flow in the total company, and thus in the overall development of an enlightened administration.

In most Indian companies, the availability of relevant data and information crucial to a decision is always a major problem. It should, however, be noted that the complexity of this problem will increase in equal proportion to the advancement of highly competitive companies in the coming years. This problem assumes its most emphatic rationale in departments such as Accounting, Marketing, and Production Control. The only way the information-processing and flow thereof can be fully integrated is through the use of a systems-design, applied to the operational problems with the top management's active support. This may briefly necessitate a sharp change in the attitude of the employees as well as the management itself, but once the advantages are known, the establishment of the new systems-approach will be easily acceptable in the organisation.

In the initial stages, Indian management will perhaps find the installation of the systems-analysis as a costly pro-

cess, in terms of added equipment, work assignments, and personnel training. This factor should be viewed by them as a long-term business investment rather than as an immediate pay-off novelty. As a matter of fact, this approach will, in the final analysis, result in lessened payroll expenses, and overall improvement in the productive resourcefulness of the company's assets and manpower.

The current industrial expansion phase of the economy will automatically require several different kinds of Feasibility studies, Manufacturing and Distribution Projects, as well as Intra and Extra Plant Flow Charts, etc.

All these industrial engineering tools are required for the better functioning of the production and marketing processes of the company. These studies will be immensely benefited, and the cost-incidence considerably reduced if these are approached with the systems-perspective in mind.

This will also facilitate an easy change-over or modification in the process, should the plant size be altered, or its marketing functions be changed. The conclusion is, therefore, clear that in the limited available resources of the country, the only rational way for industry to move ahead is through Systems-analysis.

Manpower Utilisation

A survey carried out by the Central Building Research Institute on the utilisation of manpower in two building construction sites has shown that an average worker is productive for only 70.2 per cent of his time. The findings of the survey are discussed in an article which appears between pages 574 and 579.

Fuel Efficiency & Steam Economy Services in S. India

In South India, for the past 15 years and more, the Technical Advisory Committee of the South Indian Steam & Fuel Users' Association has been rendering advice and help not only on problems of steam economy, but indirectly also on problems of fuel economy. Very recently, with increase in the demand for its services, the Association has appointed two full-time Fuel Efficiency Engineers for touring the Southern States and tackling problems after 'inplant study', using the Association's portable instruments. SISAFUA has recently enlarged its activities by including in its membership both steam and fuel users in the southern region. In this paper, Professor V. S. Jayaraman, of the University of Madras, who is a member of SISAFUA'S Technical Advisory Committee, describes some of the practical problems encountered by him and instances of help rendered. Names of the factories or industries concerned are withheld for obvious reasons.

THERE are several aspects which have to be studied when dealing with fuel economy, especially when dealing with industrial furnaces and kilns. The main problems encountered relate to—

- (a) improving combustion conditions,
- (b) utilisation of waste heat in the flue gas,
- (c) dealing with heat and draught losses due to air leakages or inadequate lagging,
- (d) Problems on chimneys and artificial draught by fans and air injectors,
- (e) choice and design of a furnace for a particular type of work, output, and materials handled.

There are also sometimes problems relating to types of oil burners and coal grates used, as well as problems of materials handling under the hot conditions of the furnace. A few cases are described below.

1. A small chemical industry which had installed a reverberatory furnace, had difficulties with its chimney draught, and problems of air leakages in its door fittings. A visit to the factory showed that the chimney was located at one end of it, far removed from the furnace to which it was connected by a long brick-work flue. There was too much friction in the long flue passages, and the flue gas was probably getting cold before reaching the chimney. An

additional chimney of medium height was recommended and built closer to the furnace. The draught improved immediately. The sliding furnace doors were also not seated properly against the furnace walls. A plastered surface was made (with a slight camber), so that in the closed position, the doors could be seated properly. This not only avoided the air leakages, but also improved the performance in the furnace, and brought down fuel consumption by about 30 per cent.

2. A pot furnace, set in a fire brick setting, was developing repeatedly a hot spot, and cracking at a particular area at its base. The pots had to be replaced every two months. On inspection, it was suspected that too much heat from the oil flame was directed towards a particular spot. The brick-setting was slightly modified to provide a firebrick arch in order to shield the pot at this place. This eliminated the trouble, and improved the life of the cast iron pot. It was found that such pots could be used for several years afterwards without replacement.

3. A rotary kiln used for burning limestone was not running quite well as it had got distorted at its ends. There was air leakage at both ends where there was too much clearance. The fixing of radial and axial sealing rings at the ends reduced the air leakage considerably. The conversion of limestone to Calcium Oxide was not quite complete, and it was suspected that the main reaction was taking place too near the discharge end. Since the oil burner used had a short flame, and the main combustion zone was too near the burner end, the oil burner was refitted with a modified nozzle which gave a more convergent and longer flame. This improved the conversion of carbonate to oxide by shifting the main combustion zone. The reduction was almost complete afterwards.

4. A furnace using a coal grate at one end was reported to be consuming too much fuel. On inspection, the bridge wall was

found to be getting too hot and absorbing much of the heat. When its height was reduced by taking away two courses of brick work, performance improved in a marked way giving better output for the fuel used. The fuel consumption was reduced to half of what it was before.

Boiler Operations

Most of the problems encountered with boiler operations related to—

- (a) The water treatment necessary to bring down scale formation and frothing;
- (b) clinkering and hot spot troubles in the coal grate due to the low-grade coal with high ash content and improper maintenance of bed depth in the grate;
- (c) inadequate or excess air supply in the primary or secondary supply side;
- (d) trouble due to deposition of scales in the tubes and shells which can often be controlled by a systematic blow down of the boiler and control of salt contents in the boiler water.

In addition, there were also sometimes troubles due to inadequate draught, inadequate trapping and venting of steam equipment, and improper installation of steam lines and fittings. A few cases where help was rendered are quoted below:

1. A factory had installed two boilers initially and, due to their expansion programme, added two more. These were also connected to the same chimney stack. It was found that the chimney draught was not adequate when all the boilers (or even if three of the boilers) were on full load. The question of improving the draught with induced draft fans was being considered. This presented some difficulty due to the type and location of the old chimney. After inspecting the sites, and calculating the draught necessary under full load conditions, it was recommended that a fresh chimney of low height, with an induced draught fan, could be provided for the new boilers, leaving

the old chimney for use with the older boilers. This solved the difficulty, and the factory was able to use all the boilers to their full capacity.

2. An agency running a laundry wanted low pressure process steam as well as high pressure steam for some ancillary machinery. They wanted steam both at 100 psig and about 30 psig. They had to condemn one of their old boilers, and go in for a new boiler. The low pressure process steam requirement was not steady, but fluctuating during the day. They were debating on the size of the new boiler to be acquired as the load was fluctuating widely. A suggestion was made to them that they could convert one of their condemned boilers, and use it as a steam accumulator, so that it could store steam for the low pressure supply. The factory would then have to acquire only a small boiler for the make up of steam on H.P. side, thus reducing their outlay. The low pressure fluctuations could be taken by the accumulator.

Coal Grate Redesigned

3. An institution installing a vertical cross tube boiler wanted it to be provided with an alternative arrangement for either a coal grate or an oil-firing system. The boiler supplied had only a coal grate. They wanted a simple arrangement to switch over easily from coal firing to oil firing. The grate was redesigned so that it could be easily removed and replaced by a diffuser plate (suitably protected by a refractory lining) so that whenever the oil burner was fitted below the grate level the hot gases could be distributed through the diffuser as the gases went up. The oil burner was fitted on an easily replaceable M.S. plate which could be fitted in the ash pit opening. This provided enough combustion space for the oil above this level. The arrangement also made it easy to change over from one fuel to another.

4. An oil burner used with a boiler was found dripping oil, and not burning

properly, at low firing rates. It was reported that the oil flow could not be controlled properly under low combustion conditions. On inspection, it was noticed that the oil used was fairly cold and viscous. An electrical heater was introduced in the overhead supply tank, so that the heated oil had a much lower viscosity. The low pressure air supply line to the burner was also re-arranged, so that the air got preheated by the furnace itself. This improved the combustion even under low burning conditions.

The above examples are only a few, selected at random, giving the diverse type of help and services which were rendered to steam and fuel users. Fuel and steam efficiency services in the past were often limited owing to lack of suitable data from the parties desiring help. Most of the industries do not have instruments or facilities to measure or check their process variables. With the portable instruments recently purchased and the full time technical officers now employed by the South Indian Steam & Fuel Users' Association, it is hoped that better and more systematic service can be rendered to fuel and steam users in the Southern States after getting recorded data on their day-to-day performance.

A New Publication

PRODUCTIVITY IS FOR YOU TOO

By K. Pennathur

(See announcement on page 660).

Productivity in an Automobile Service Station

PRODUCTIVITY techniques, it is often remarked, can be successfully adopted only in production units. But our experience as automotive engineers amply bears evidence to the fact that these techniques can be usefully applied in service set-ups also. For the sustained growth of an organisation, constant improvement in the methods of work is necessary. With this objective, we started a Methods Engineering Department in 1960. It has studied various aspects of work in the repair service as also administrative departments.

Washing and Lubrication

Regular washing and lubrication of a car or truck is a prime necessity for its maintenance. To speed up the flow and increase the output, on the basis of the studies, changes in the sequence of operations were suggested which should be done while the vehicles are on the lift. This increased the utility of the lift, and productivity. We have two lifts in the washing and lubrication section. Before our study, we serviced five cars per lift, i.e., 10 cars a day on an average. By changing the sequence of operations we have been able to do more than 10 cars per lift, i.e., every day we service more than 20 cars. This is done without increasing the strength of workers. Hence, productivity is increased by about 100%.

An exhaustive 'Integrated Plant Survey' was conducted. This covered almost all the aspects in the utilisation of men, materials, and machines in the different departments of our service station. Techniques such as Method Study, Time Study, Job Evaluation and Planning Methods were put to use in the studies conducted.

In the process of reconditioning automotive parts, they have to flow through departments like Machine Shop, Welding and Fitting. One of the significant results of the studies was the introduction of a system by which delay is avoided and the

flow of jobs is considerably speeded up. More jobs are also being turned out. Further, machine utilisation has improved.

Time Standards

We have studied all the jobs in detail, and set up Time Standards which have helped to increase productivity. They also form the basis for Job Costing.

Job Description for all grades of workers has been made out. The procedures for carrying out jobs have been standardised in a suitable manner, so that workers can clearly understand them to carry them out methodically. Productivity is also maintained and increased by setting up targets in the respective departments, and intensive follow-up is made not only to reach but to exceed the target.

Administrative procedures and practices are periodically studied to eliminate delay and duplication. Studies were conducted to quicken the process of valuation of jobs, and in making out bills. It is worth mentioning that because of these studies duplication in writing and copying was cut off and simple methods were suggested.

Suggestion Scheme

A suggestion Scheme has also been

organised in which the workers and foremen can participate. Cash awards or token awards are also being given frequently. Considerable improvements have been made through the valuable suggestions received from the employees.

The new processes or methods introduced by our executives and assistants are disseminated to our various branches and other units through a bulletin.

We have a service training school to train the workers in the various branches of automotive service. Regular classes are held, and oral and written tests conducted. This has improved the quality of service. The school is well-equipped with models and audiovisual aids such as epidiascope and projectors.

We have also sent members of our staff of all ranks to the various programmes conducted by the National Productivity Council and other management organisations. Quite a number of people have been sent abroad for training. We are also conducting training programmes for executives, supervisors, and workmen, with the help of personnel from the Productivity Councils.

Our workshop is kept scrupulously clean and the workmen are educated on the need for good housekeeping, through our house organ.

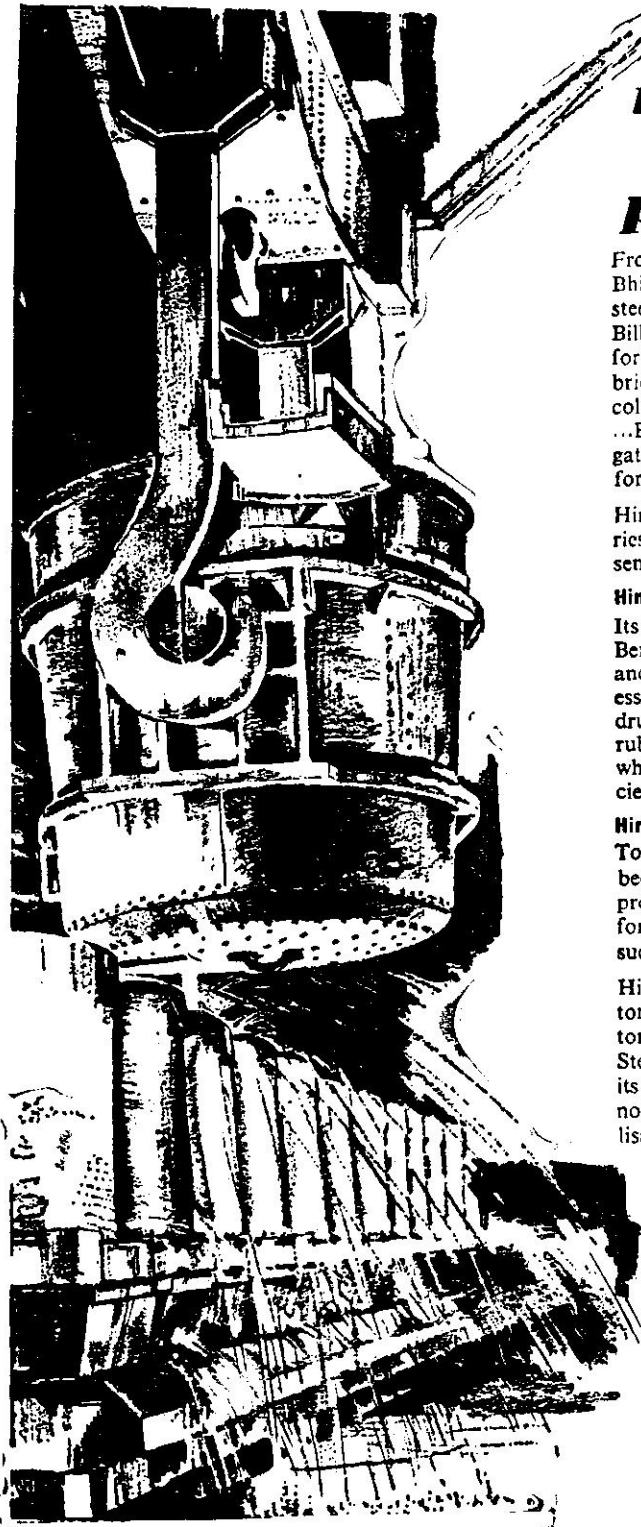
MANAGEMENT DEVELOPMENT

By Ellis O Keller

This book summarises the modern role of management, and sets out clearly and completely, yet concisely, the text and tenets of the subject of management development. Also contains instructive case studies from Indian industry to illustrate the applied side of management skills.

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moulding the nation's prosperity

From Hindustan Steel's three plants at Rourkela, Bhilai and Durgapur comes over 3 million tonnes of steel every year—steel in various shapes and forms. Billets for rerollers...rails, sleepers and wheel sets for the railways...plates, bars and structurals for bridges and dams and wagons and ships...hot and cold rolled sheets for general engineering industries ...ERW pipes for oil and gas transportation and irrigation...alloy and special steels now vitally needed for defence.

Hindustan Steel also supplies to the hungry round-ries over 800,000 tonnes of pig iron every year representing some 80% of the country's available supply.

Hindustan Steel makes chemicals and fertilizers too...

Its comprehensive range of by-products includes Benzene, Toluene, Road Tar, Pitch, Naphthalene and other coal-based groups of chemicals which are essential for the manufacture of plastics, paints, drugs, dyes, insecticides, explosives and synthetic rubber. Yet another vital by-product is fertilizer which is so urgently needed to achieve self-sufficiency in food.

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To date over Rs. 137 million in foreign exchange has been earned through the export of steel and by-products. And new deals are already in the offing for increased exports of rails as well as new items such as pipes and coils.

Hindustan Steel's capacity is being raised to 6 million tonnes and will be further expanded to 10 million tonnes by the end of the Fourth Plan. Hindustan Steel is growing fast—faster than any...for, to play its part in moulding the nation's prosperity, it should now strive to keep pace with the rapid industrialisation of the country.



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IPY-1966

No doubt, India Productivity Year-1966 has been a positive success. Many exhibitions, seminars, and symposia on productivity techniques were held in State capitals and other centres as a part of the organised efforts to create productivity consciousness in the nation as a whole.

In the following pages, *Productivity* presents a pictorial feature which depicts some of the programmes organised by NPC, its Regional Directorates, and Local Productivity Councils.



Exhibitions serve a useful purpose in that, they convey to the people, in an easily understandable form, the basic problems of productivity. As part of IPY-1966, a number of Productivity Exhibitions were held in different parts of the country. Left: A view of the exhibition held at Surat. Top: Visitors studying improved plant layout model at the NPC Pavilion put up by the Ludhiana Directorate of NPC at the industrial exhibition organised by the Punjab Government at Ludhiana in September. Bottom: Mr Dharam Vira, Governor of Punjab and Hariyana, viewing some of the exhibits. Seen with him is Mr Paramjit Singh, Director of Industries, Punjab.



The Assam Productivity Council has been doing a lot of work to bring home to industries in the region the techniques of higher productivity. During the last eight years, it has organised a number of training programmes in NEFA, Manipur, Tripura and Nagaland to meet the demands of the small industrial units and a number of other organisations.

Below: Mr KP Tripathi, Industries Minister, speaking at a National Seminar on Agriculture held at Gauhati in October. Left to Right are: Mr RN Singh, Hony. Secretary, Assam Productivity Council; Mr Shahid Pravin, Regional Director, NPC, Calcutta; Mr Tripathi; Dr N Das of Gauhati University; and Mr P Mazumdar, Director of Agriculture, Assam.





A number of industrial units are devoted to the question of self-reliance. One such unit is the HHE Transformer Works at Tiruvottur (Madras) which was visited by the Union Minister for Industries and the President of the National Productivity Council, Mr. Sanjivayya, in October. The Minister (left) is seen going round the factory accompanied by Mr. K. Easwaran, Chairman and Managing Director, KR Sundaram, Joint Director, and Mr. Hedley, Technical Director.





Mr Jagjivan Ram, Union Minister for Labour and Employment, speaking on the Role of Labour in Productivity at a seminar organised by the Delhi Productivity Council at India International Centre.



As part of the IPY celebrations, a number of colleges organised debates, and essay and elocution contests on productivity subjects. In Bihar, the Patna Productivity Council organised an elocution contest for college students in Patna in September. Left: A view of the audience. The Hon'ble Justice H Mahapatra announcing the results of the contests. Principal Mahendra Pratap, of the Patna College, is on his right.



In Delhi, the Delhi Productivity Council, in collaboration with NPC, organised a number of seminars and training programmes. Above: A view of the participants at the Seminar on Management Control and Ratios held at India International Centre in October. Below: Mr AN Jha, Lt. Governor of Delhi, and Chairman, IPY State Committee, participating in a meeting of the Committee.

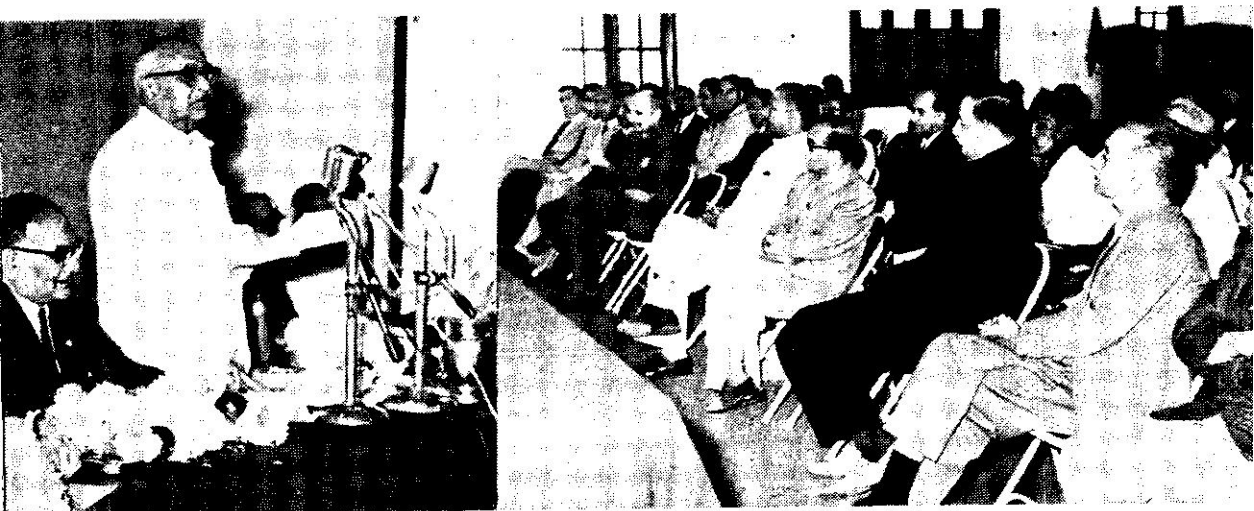




To remove inefficiency in the utilisation of fuel, NPC's Fuel Efficiency Service has rendered valuable service to industries in the last two years. A number of seminars were organised during IPY. Above: (from right to left) Mr K Pennathur, Executive Director of NPC, Mr BN Bhaskar, President, Delhi Productivity Council, Mr MS Malancy, Managing Director, Wester Work Engineers, Pvt. Ltd., and Mr PR Srinivasan, NPC Fuel Efficiency Engineer, at a function organised by DPC in connexion with a seminar on the subject held at New Delhi. Below: Mr KG Khosla speaking on Waste Reduction at a meeting organised by DPC at the Indian Standards Institution, New Delhi.



In connexion with the observance of Productivity Week, a meeting of managements, trade unions, and other interests was organised at Madras on Oct. 19. *Below:* Mr R Venkataraman, Madras Minister for Industry, speaking on the importance of adoption of productivity in every walk of life. *Bottom:* Mr S Nijalingappa, Chief Minister of Mysore, and the President of the Mysore IPY Committee, addressing the gathering on the occasion of Productivity Week held in Bangalore on Dec. 1.



A Case Study

Production Planning in a Limestone Quarry

RP NADKARNI
*O & M Officer, Voltas
Bombay*

“MY SHOVEL and dumper downtime has been high, Sir, on account of frequent breakdowns of the machines that had poor maintenance. Also, the long distance of three miles between the new limestone hill and our stone-crusher has lengthened the cycle time of our dumpers, with the result that our dumper-trips per shift are fewer now,” rattled off the Quarry Manager when asked by the Works Executive to explain why limestone production had been consistently low during the past six months or so.

I happened to be present in the Works Executive's cabin when this conversation took place.

“Here is the person who might be of use to you in tackling your production problem”, said the Works Executive to the Quarry Manager, pointing his finger at me.

“I should be happy indeed if he helps me solve it,” sighed the Quarry Manager, looking hopefully at me.

“I am willing to do so, Sir, to the best of my ability,” assured I, little knowing what was in store for me though!

The following day I set my foot in the mechanised quarry, about 10 miles away from the Works. The quarry spread over two hills from where limestone, blasted earlier with dynamite, was being loaded by mechanical shovels and transported by dumper-trucks to the stone-crusher.

“Our requirement of stone is about 1,800 tons per day of 3 shifts. We are able to raise 1,400 to 1,500 tons daily. We have 3 drills, 3 jack-hammers, 2 bulldozers, 3 shovels of 3 cubic yards capacity each, and 6 dumpers of 15 tons capacity each. But still we need at least one shovel and two dumpers more to meet our production target,” explained the Quarry Manager, taking me round the quarry in a jeep. “I know they would cost us over seven lakhs of rupees,” he continued, “but since our

existing machines are down for repairs every now and then, I am afraid, we will have to go in for additional new machines. Anyway, now that you are here, you could examine the aspect of machine maintenance." He then left me in the quarry.

I started wondering whether, and if so why, machine breakdown could be so frequent. So, I decided to meet the Quarry Maintenance Engineer.

"I may proudly say that I have been maintaining all the machines as well as their records for over six years, and I assure you that they are looked after to the best of my ability," said the Maintenance Engineer, with confidence.

"Can I have a look at the records, please?", I asked.

"By all means," was his reply.

For the next few days I carefully analysed all the maintenance records, only to find that the downtime of the machines was not at all high but reasonable, it being around 16% of total machine hours for shovels, dumpers and bulldozers. For other types of machines it was much lower. I also found that the necessary preventive maintenance schedules had been carried out fairly well for various machines.

Machine Utilisation

That put me in a real fix because the Quarry Manager had given an impression that the machine downtime was high due to poor maintenance, but the maintenance records revealed something quite the contrary. I, therefore, started doubting whether the reasons for low production, despite availability of enough machines for work, could be anything else but maintenance downtime. So, I decided to conduct further investigations through a field study of machine behaviour and utilisation.

As the quarry operated round the

clock, each 8-hour shift was studied for a week to determine

- (i) time standards for operations like drilling holes in the rock, blasting the rock, jack-hammering boulders, blasting boulders, loading stone in a dumper by mechanical shovel and transporting it by a dumper,
- (ii) inter-relationship of these operations to enable proper planning and coordination,
- (iii) utilisation of machines during the shifts with respect to their availability,
- (iv) reasons for delays, machine downtime, and resultant production loss.

The study was thus broadbased. It, therefore, brought to light several important facts that were mainly responsible for low production. These are mentioned below in the sequence of basic operations.

Drilling of Holes

- (i) There were no proper standards for drilling in terms of footage per hour; hence effective control was lacking.
- (ii) Drilling was not planned in relation to production capacity per shift of shovels and dumpers, and blasting was not coordinated with
- (iii) Unscientific spacing, depth and drilling, with the result that for want of enough blasted stone, shovels and dumpers remained idle largely during the shifts.

inclination of holes resulted in low stone output per pound of blasting charge.
- (iv) Supervision was inadequate. This led to a sizable idle time of drillers and drills.

- (v) Insufficient air pressure lowered the efficiency of pneumatic drills.
- (vi) Arrangements for providing light at drilling sites during evening shifts were inadequate; drilling could not, therefore, be continued after the sunset; and output was thus lost.
- (vii) Drills did not suffer downtime on account of breakdowns during operation.

Blasting of Rock

- (i) Blasting work was not well organised, nor was it in relation to drilling. This resulted in considerable wastage of manhours of the blasting gang.
- (ii) Drilled holes were not charged scientifically with respect to the 'burden' of rock to be blasted. Therefore, the yield per pound of blasting charge was low. It also produced many large boulders which necessitated further drilling with jack-hammers, and blasting.
- (iii) Blasting was not co-ordinated properly with the operation of drills, shovels, dumpers, etc., so that, before blasting could be done at site, all the machines had to be taken away for safety and brought back when blasting was over. This meant an idle time of over half an hour for each of the machines and their operators in the morning or evening shift, whenever blasting was necessary.
- (iv) The long electrical cables of blasting equipment were not in good condition, and as such either their connections became loose or they snapped. Often, locating and rectifying such defects delayed blasting further, and resulted in longer downtime of all machines.

'Richest Fruit of NPC's Work'

Dr PS Lokanathan, in a recent message to the Editor, says: "This is to send you a word of thanks and appreciation for sending me a copy of the latest NPC Journal (Vol. VII, No. 3). The Journal is one of the richest fruits of NPC's work and activities. It has established itself as one of the foremost Journals in India as well as abroad. I would like to congratulate you on the high quality of the Journal which you have consistently maintained..."

Operation of Bulldozers, Shovels and Dumpers

- (i) Clearing of the site after blasting by using a bulldozer to collect the blasted stone and making room for a shovel to work conveniently, was not synchronised properly and as such delayed shovel and dumper operation.
- (ii) The allocation of the number of dumpers per shovel at site had no relation to the distance between the site and the stone-crusher, so that shovels remained idle during the time when dumpers were busy transporting stone.
- (iii) As distribution of shovels and dumpers was not done in relation to the availability of stone at sites, shovels had to be shifted from site to site where it was available. This shifting involved ½ to 1 hour of unproductive time and also an excessive wear and tear of crawler tracks of shovel.

The machine downtime on account of these reasons was as high as 55%, as against only 8% on account of maintenance as can be seen from the table below:

Shift	Shovels		Dumpers	
	Mainte- nance	Above reasons	Mainte- nance	Above reasons
I	14%	35%	14%	40%
II	6%	64%	8%	58%
III	4%	75%	4%	54%

Working out of Plan

My doubts that the main reasons for low output could be operational inefficiency and lack of planning and co-ordination, and not machine breakdowns and poor maintenance, thus came out to be true. They were further strengthened by the analysis I made of operational logbooks for shovels and dumpers for the preceding six months, which also revealed that machine downtime on account of maintenance during working shifts was low.

I was now confronted with the stupendous task of correlating all the data collected, observations made, and machine output standards computed to evolve a workable scheme for improving production to meet the target of 1,800 tons of stone per day of 3 shifts. Thanks to Gantt, his charting technique came to my rescue. I prepared a comprehensive plan for well-coordinated working of drills, blasting gang, jack-hammers, shovels, and dumpers. It was pictorially presented to the Quarry Manager as shown in the accompanying chart to enable him to organise, co-ordinate, and control the basic quarry operations.

I patiently proceeded step by step as follows:

- (i) I calculated the 'yield' of stone per pound of blasting charge on the

basis of proposed practices of drilling (i.e. proper spacing, depth and inclination of holes) and blasting (i.e. proper loading and tamping of holes and use of correct detonators).

- (ii) I determined the relationship between the 'yield' and the depth of a drilled hole. Knowing this and the monthly target for production of stone, I worked out the total requirement of footage to be drilled.
- (iii) Next, I computed drilling machine hours required to meet this footage, knowing the achievable standard hourly footage per drill established by studies.
- (iv) I then allocated the drills in each shift to ensure that the drilled footage provided enough stone at site to minimise shifting of shovels from site to site, and to maximise their productive time by taking long uninterrupted runs.
- (v) Next, I synchronised the blasting work in such a way as not to interrupt the operation of drills, shovels, and dumpers. Blasting was proposed to be done at one site while machines worked at another, at a safe distance.

Time Standards

- (vi) Although drilling and blasting were proposed to be carried out scientifically, formation of boulders, though much reduced, could not be avoided completely. For breaking boulders, I determined the requirement and allocation of jack-hammers, as I knew from studies the hourly footage and the yield per foot of a hole drilled by a jack-hammer.
- (vii) Knowing the time standards for

loading stone in a dumper by a shovel, carrying it to the stone-crusher and return trip of the dumper, I worked out optimum shovel-dumper combination for each site and each shift to minimise idle machine-hours. While doing this, the necessary time for preventive maintenance routines (lubrication and general check-up) was allowed for to determine machine hours available for production.

"Selling" the plan to the Quarry Manager was, however, a tougher job than preparing it, as it almost shattered all his 'impressions' of quarry operation. How-

ever, as it was the outcome of detailed field studies, actual observations and careful analyses of past records, it was finally acceptable to him. I was much satisfied that my hard work of over two months had been fruitful!

Conclusion

On the basis of this experience, it may not be inappropriate to generalise that a production planning study should be aimed not merely at establishing operational time standards, but should have a much wider scope to bring to light various factors responsible for low production, and should also suggest economical measures to rectify them.

The Cost Factor

In 1960, a U.S. dairy replaced its horses, which were pulling its milk wagons, with trucks.

According to a recent report, it is retiring half of its fleet of trucks, and replacing them with horse-drawn wagons.

Sentiment did not inspire the return of the horse. A two-year study, however, had shown the horse to be more economical, efficient, consistent, and speedy. To maintain the fleet of trucks it cost \$25,000 a year. Horse maintenance cost only \$365 a year. A good horse can be bought for \$400 while a truck costs about \$6,000, and hay and oats are cheaper than gasoline and oil. Horses can be faster on certain runs. Some horses are more durable than trucks. One horse worked for 20 years. And what is more, the public seems to like the idea of the horse making a comeback.

Changes in Employee Expectations in India

AN ANALYSIS of case studies, collected in Delhi University, indicates a revolutionary change in the expectations of low-income groups during the post-Independence period.

These case studies are entirely based on facts drawn from actual situations in the country. The response of most managements both in the public and in the private sectors to these changes in expectations has been slow. And this in turn has multiplied tensions in employer-employee relations.

The cases suggest that the expectations and the attitudes of workers and other subordinate personnel are changing fast.

For one thing, most employees in independent India have become highly

conscious of their rights. While not even two decades ago they submitted quietly most of the time to the superior attitude adopted by the managerial and administrative class, they now demand to be treated on terms of equality, as human beings. Such consciousness of an enhanced status in their own eyes on the part of employees can be easily illustrated. In pre-1947 days, in the Kashmir valley, it was very common to call the porter *hato*—a local word which really was very derogatory. No porter minded being thus addressed. The word '*hato*' had become a part of the accepted language and was freely used by people belonging to the so-called decent society. No one felt any qualms of conscience in addressing a porter by a word which in effect meant that the man thus called was less than a human being.

After Kashmir ceased to be a princely

state and freedom came to the valley, the porter if called '*hato*' felt offended. In a few cases persons who persisted in using the word were physically assaulted so that the point could be hammered home. In short, the same word which had become a part of culture came to be looked upon as sufficiently offensive to provoke physical violence in some cases.

Kashmir is only one of the sixteen States in India. What is true of the change in the workers' mentality in Kashmir is true of other States.

Let us take another instance. The domestic servants—by far the most exploited category of labourers in India—have also come into their own after the advent of freedom. Not only is an increasing number of servants developing an aversion for this profession—and not only are they becoming costlier to get—they are also demanding better treatment from their employers. What is more, domestic servants have formed themselves into unions in leading cities like Delhi, Bombay and Calcutta—something that was unthinkable only two decades ago. In fact, the belief held dearly by feudalistic elements (whose greatness was judged by the number of domestic servants) was that some human beings were born low. The role cut out for them by destiny was to serve their superiors, as slaves. The story is told of a Maharaja who if annoyed with his servant would order his head to be chopped off. This kind of occurrence is very much a thing of the past. Treating a domestic servant badly especially in big cities involves incurring the wrath of a militant union which is prepared to swoop on its victim. I personally heard the following conversation between a master and a servant. "You can either join the union or remain in domestic service", said the master. "I shall do both", replied the servant with an air of confidence and self-assurance that would have shocked and

surprised the most ardent liberal only twenty years ago.

Similarly the category of workers—called the scavengers and sweepers—have suddenly discovered their powers, as if by the touch of freedom. They were reconciled to being treated like menials in the past. In the post-independence period even this category of workers seems to have acquired a new sense of self-respect. Some sweepers, for instance, resent being called *Bhangis*. They prefer to be called by their names.

Change in Attitudes

The instances given so far are all outside the cases. Let us turn to the cases to illustrate the change in attitudes and expectations. In the case of 'The National Globe Company,' Ram Dhin—a white-collared worker—resents the attitude of the Section Officer, Saxena. He expresses his protest verbally to his boss despite the knowledge that rudeness on his part may cost him his job. Selected out of a whole host of applicants, Ram Dhin is adjudged the best at the interview. Not only is he the best among the applicants, he also gives an impression of intelligence and efficiency during his probation period. Suddenly Saxena notices that Ram Dhin is leaving his seat too often. Ram Dhin's work is still satisfactory. Having finished his work, he leaves his seat and relaxes over a cup of tea. Saxena calls him to his room and without exchanging any pleasantries, asks straightaway: "I find you leaving your room too often these days." Ram Dhin's pride is hurt. His reply is cold. "When I finish my work, I go to the canteen to take my tea." Saxena piqued by this cold reply starts threatening: "It is against office discipline to go to the canteen during office hours". Ram Dhin's reply is again cold: "If my visits to the canteen interfere with my work, then I will stop going out."

Saxena keeps a close watch on Ram Dhin thereafter. Ram Dhin, in turn, develops a feeling of being persecuted. He reacts by taking a few other colleagues out for tea during office hours. Saxena considers this a challenge to his authority. He starts giving Ram Dhin more than normal share of work. A sharp exchange follows in which Ram Dhin gives the Section Officer a bit of his mind. He charges him with unfairness and vindictiveness. When Saxena warns him that his behaviour is undesirable, his reply is characteristic of confidence or rudeness depending on whether one is looking at it from the standpoint of the employee or viewpoint of the management. "I know what you are driving at", said Ram Dhin. "I might as well tell you that it is not easy to dismiss me. Even if you succeed in dismissing me, there is no dearth of jobs for a good typist."

Gone are the days when fear of authority dissuaded the workers from exercising their rights. Absolute blind obedience of authority is fast disappearing.

'Be My Guest'

"Be My Guest", says one supervisor to another at General Motors Corporation (Linden, NJ), and he really means it. It's part of a training programme to familiarise supervisors and general foremen with one another's problems, reports *Factory*.

Two supervisors, with little or no direct contact on the job, alternate host and guest roles weekly. For one hour, the guest sees his host in action. Often he discovers different ways to solve common problems. And he can better understand how other functions fit into the total plant activity. Later in the week, the two supervisors exchange roles.

Even a low grade employee like a typist goes to the limit of staking his job to enforce what he thinks is his 'right'.

The attitudes and expectations of supervisory and other subordinate managerial personnel are also changing more rapidly compared to those of managements. This change can best be illustrated with reference to the case of "Rama Sugar Mills", (see Appendix). This Mills—an oldest sugar concern of U.P.—was having an anxious time on account of a nation-wide strike that had affected the entire sugar industry. The management thought that the local unions would certainly go on strike, but it did not fear any untoward happening. The relationship between the company officials and the employees being very intimate, their loyalty was taken for granted. However, the bitterness expressed by the workers exceeded all reasonable limits.

Management was highly disturbed by the strength of employee reaction. As soon as the strike was over, the Managing Director called a meeting of the executives to discuss the causes of the unusual reaction of the employees during the period of the strike. Different interpretations were put on the abnormal behaviour of the employees. However, all the executives agreed that a shifting inquiry must be made to get at the roots of dissatisfaction. A survey of opinion among the workers immediately after the strike being difficult, it was decided to interview supervisors to get the feel of the atmosphere.

A firm of Management Consultants was employed to conduct the survey. Every supervisor was asked the following questions:

- (i) Why do you think our employees are so disturbed in this strike?
- (ii) Do you have any comments on your work in the company?

All supervisors were unanimous in

attributing the discontent among the workers directly to one Mr. Grover, a Plant Superintendent who supervised the work of the supervisors and was also in touch with the workers.

The reply to the second question took the form of comments on all aspects of the organisation: "...the company is not a team, rather it is a congress of individuals with none at the top to pull them together... too many departments... too much red-tape... too much a one-man show... We do not honestly know what the policies are around here... we... work in the dark... frequent change of decisions by top management undermines the authority of the supervisors in disciplinary matters... (there's) an iron curtain between the plant and the front office..."

The comments made it clear that the supervisors expect clear instructions and a clear definition of their authority. They certainly do not relish the idea of the manager treading on their toes. This represents a vast change from the days when they largely danced to the tune of their managers.

There are reasons which explain the inability of managers and administrators in meeting this revolution of rising expectations among the employees. Indian home life is characterised by the joint family system under which authority is concentrated in the head of the family, who takes all the decisions. His word is law. No member can question his judgment. This subservience to authority is carried to other facets of life as well. It is particularly noticeable in industry and administration. The managerial and service personnel, by and large, consider it their birthright to issue orders. And their subordinates deem it a privilege to carry out those orders. There is hardly any tradition of challenge to authority from the lower ranks.

Again, Indian society has traditionally

been hierarchical and caste-ridden. Though the caste barriers are breaking down in the cities, one's status in society is still largely determined by one's social origin. And since the labouring, and even white-collared, classes have generally a humble social origin, they are expected to submit to whatever treatment is meted out to them. They are expected neither to reason why, nor to make reply, much less challenge the superior judgment of the administrative managerial classes.

Impact of Colonial Rule

Yet another reason is that India has gone through a long period of political subjugation under the British Raj. An authoritarian spirit pervaded the entire colonial administration. Indians were taught to respect authority and hold it in great awe. The colonial rule has, therefore, reinforced subservience to authority in India.

Prof. C. N. Vakil¹ thinks that the representatives of Government, namely the politicians and the civil servants continue to be treated with awe and respect even in independent India. To quote, "so much importance is being given to this class that there is not a function, however trivial, where a Minister does not participate, and there is not an occasion, however small, where the administrator is not flattered. In consequence, the fact that the politician or the administrator is a servant of the people whose object should be to help and respect the people and not dominate or boss over them, is being forgotten."

It is not intended to suggest that all employers have failed to grasp the significance of the transformation in the attitudes and expectations of the employees. Nevertheless it is true that the majority of employers still think "that the workers can be parcelled out like bales of cotton, the appropriate muscles being employed

without reference to the volition of the owners."- However, some enlightened managements have already responded to the requirements of the changed situation. There is definite evidence of change especially in personnel policies, efforts being made to make them more scientific. The establishment of ATIRA and SITRA are instances in point. The express aims of these organisations are to conduct research on questions connected with (i) workers' adjustment to factory life and (ii) higher output.

Personnel Policies

There are instances of individual companies which are following enlightened personnel policies. A Case-Study on Labour, Management Consultation and Cooperation in TISCO³ has revealed that the relations between management and labour are governed by mutual trust and cooperation. The harmonious relationship has been traced to (i) satisfactory wages (ii) living and working conditions (iii) performance bonus (iv) incentive wage (v) profit sharing scheme and (vi) consultation between union and management at different levels.

Similarly the practice of employing non-technical persons on technical jobs is fast disappearing especially in textile mills. Even among technical people, the textile graduates are preferred.

In these cases too there is evidence of change coming over certain managements. A few cases show that some personnel managers are beginning to practise the human relations approach, and with good results. For once, the standard method of charge-sheet, inquiry and punishment is given up in favour of a personal, persuasive approach. And there is evidence that employees do respond to the personal approach.

The reasons which have compelled this modification in the traditional mana-

gerial philosophy are not far to seek. First, the divorce between ownership and management, especially in the case of leading English and American firms, has resulted in the partial growth of professional management in India. Secondly, an increasingly complex technology requires specialized employees in a position to exercise skill and judgment. Such employees demand a treatment other than authoritarian. Thirdly, the progressive associations of employers like management associations and chambers of commerce have played their part in bringing about a change in the traditional managerial philosophy. Fourthly, trade unions (which are becoming more and more vocal) have brought their pressure to bear in favour of change. Governmental legislation has also done its bit in effecting a change in managerial attitudes. Above all, the education of the present-day executives at home and abroad is responsible in no small measure for the slant in managerial philosophy that is noticeable in the case of some companies.

Nevertheless, the broad truth remains that the vast majority of employers in this country still conceive of industrial relations in master-servant terms.

The master-servant approach worked without much friction before Independence because the general run of workers were either unaware of or unable to assert their rights. The workers as a class were meek and submissive. They had blind faith in their employers and an unshakable belief in fate. They were by and large a contented lot and presented no problems of ego-recognition. There were individual instances even in those days of industrial strife, for the vindication of workers' rights. The vast majority of workers, however, were blissfully unaware of their rights. In an address to a rally of labourers, Gandhiji once observed: "Who is to determine the standard of wages and the standard of comfort required by the

labourers? The best way, no doubt, is that you labourers understand your own rights. Understand the method of enforcing your own rights and enforce them. . . .” In an article in *Young India* Gandhiji stated:⁶ The greatest political contribution that the labourers can make is to improve their own condition, to become better informed, to insist on their rights, and even to demand proper use by their employers of the manufactures in which they have had such an important hand. . . .”

The migratory character and the generally low standard of literacy of the Indian working class, however, came in the way of realising Gandhiji's ideas. With such a kind of working class, the master-servant approach could not but flourish. In fact, the worker's whole background, his training, his work experience

taught him to look up to his employer for everything including the settlement of domestic quarrels sometimes. There was not much place for labour protest or modern trade unionism in this kind of an environment.

The bulk of the workers being submissive, there was no check on coercion and unfair labour practices. Very often there was evidence of greater regard for profit than for labour welfare. Even the statutory rights of the workers were not strictly enforced. Referring to the welfare activities of the employers, the Labour Investigation Committee of 1946 made the following observation:

“On the whole, it may be stated that the employers who take a most indifferent and nonchalant attitude towards welfare work and say that no rest shelters are provided as the whole premises belong to the

Real Productivity String to Foreign Aid

The US economist Professor S Enke (*Economic Journal*, March 1966) calculates that in the poorer countries expenditure on birth control is 100 times more effective, in raising income per head, than any other form of investment.

“Even allowing for a huge margin of error in his calculations”, writes the *New Statesman*, “such investment would still be at least twice as productive as any other. If, for instance, in a country like India, birth control produced a mere 12½ per cent drop in the birth rate, reducing births per 1,000 from 40 to 35, the result would be a ½ per cent increase a year in income per head. To secure such a rise by ‘conventional’ investment would require colossal sums. Countries and agencies which give aid now, in most cases, impose stringent conditions on the governments which receive it. They would get more impressive results if they merely insisted that 10 per cent of aid should be spent on birth control programmes.”

workers themselves, no latrines are provided because the workers prefer the open spaces, no canteens and sports are necessary because they are not likely to make use of such facilities, and so on, constitute the majority. . . .”

In fact, the conception that a human being, however low his social origin, is entitled to dignity and fair treatment was nonexistent in the early days of industrialisation in India. Towards the close of the 19th century modern influence began to penetrate the Indian scene. One started hearing the rumblings of labour protest for the first time. World War I reinforced this trend, “Prior to the winter of 1918-19, strike was a rare occurrence in Indian industry. Lacking leadership and organisation and imbued with a passive outlook on life, the vast majority of Indian workers regarded the return to the village as the only alternative to the endurance of hard conditions in industry. The end of the war saw an important change.”⁸ Important strikes occurred in 1918-19 and 1920-21. Again the period of 1928-29 was marked by great industrial strife.

Attitude of Labour

This strife notwithstanding, the attitude of the bulk of the labour force in India towards the employers continued to be, by and large, reverential. The working class generally was still submissive. Even as late as 1944-46, the Labour Investigation Committee remarked: “His (worker’s) illiteracy, ignorance and helplessness have been largely availed of by some employers who have been able to break or disregard the law with impunity. Very often, the worker himself has been a party to this, and even where he has been aware of his rights he has connived at the breaches of law for the simple reason that security of employment to him is more important than the assertion of his rights.”⁹

This was the situation in 1946. Not

to speak of assertion of rights, the workers were sometimes willing and sometimes unconcerned spectators of the open breaches of labour legislation. It was in this state of labour-management relations that independence came. Nineteen years of freedom have witnessed tremendous changes in India in all spheres of social life, so much so that old employers feel that the established behaviour patterns among the employees are going topsyturvy. A wind of change has swept across the cities and towns, and is, slowly but surely, blowing through the countryside. Independence, parliamentary democracy, adult franchise, impact of industrialisation including rising living standards, education, mobility, communication, Directive Principles of India’s Constitution entitling everyone to equal opportunities, Fundamental Rights like freedom of speech, association and profession, the declared aim of the ruling party to achieve a socialist pattern of society, progressive labour legislation, success attending some worker initiatives, news from abroad emphasising equality, rights and self-respect—all these factors together have wrought a rapid transformation in the attitudes and expectations of the low-income employees. There is a new awareness of rights, a new sense of self-respect. There is a greater realisation of the value of strike as a weapon, and disappearance of faith in employer judgment of worker welfare. The employees refuse to be treated as inferior beings and refuse to be a party to open breaches of labour legislation.

True, there are still some employees, even in present-day India, who refuse to shed their slavish mentality. The employees as a class, however, have begun to assert their rights. They have begun to ‘look-up’, as it were. Some enlightened employers have recognised the wind of change. Many others are puzzled and irritated that the employees once obedient and well-behaved should suddenly become defiant.

APPENDIX

The Case of Rama Sugar Mills

The Management of the Rama Sugar Mills were highly disturbed by the resentment felt and the violence unleashed by the workers in a strike that affected the entire sugar industry. The Directors were very keen in exploring the causes of the unusual bitterness displayed by the workers during the strike period, especially because the strike at other sugar mills in the country was very peaceful.

The Rama Sugar Mills was one of the oldest sugar concerns in Northern India. Situated in Eastern U.P. in a town inhabited by about 45,000 people, it was the largest employer in the area. The company produced all varieties of sugar including crystal sugar and a limited number of confectionary goods. The industry was seasonal. The workers appeared quite reconciled to the seasonal nature of the industry.

During October 1959, a general strike for wage increase was called by the principal unions in the sugar industry. Production in all major companies came to a standstill on account of the strike. The local union at the Rama Sugar Mills joined the strike. Production was therefore suspended. Though the strike covered the entire industry in different parts of the country, it was generally peaceful, but the Rama Sugar Mills workers expressed considerable bitterness against the employers. Even violence was indulged in on some picket lines which necessitated police intervention.

The top management became deeply concerned with the strength of employee reaction against the company. The abnormal behaviour of the workers came as a shock to most of the executives of the company. It was, of course, expected that the local union would strike in sympathy with the sister unions. No one, however, thought that the strike would become an occasion for ventilating accumulated bitterness, and extreme bitterness at that. The executives, in fact, were so sure of their relations with the workers that they had taken their loyalty for granted.

Supervisory Opinion

As soon as the strike was over, some kind of soul-searching was going on inside the organisation. The Managing Director called a meeting of the executives to look into the causes of the hostility shown by the workers during the strike period. Different interpretations were offered on the behaviour of workers. However, all executives were unanimous on the need for instituting a thorough probe into the causes of indiscipline. Some executives suggested a survey of worker-opinion to get at the basis of dissatisfaction. The suggestion was, however, ruled out by the Managing Director. This kind of opinion survey among the workers immediately after the strike, he thought, was not possible. It was, however, agreed to survey supervisory opinion to get the feel of the atmosphere.

The services of a firm of management consultants were requisitioned. The following two questions were addressed to every supervisor:

1. Why do you think our employees were so disturbed in the recent strike?
2. Do you have any comments on your work in the company? The supervisors were assured that their replies would be treated as strictly confidential and would

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in no case be disclosed to the company. The responses were frank and indicated a general desire to "get things off my chest".

Almost all the supervisors interviewed were unanimous in attributing the bitterness among the workers directly to what had happened under a former plant Superintendent, Mr. Grover, who had worked with the company for 12 years. A good production man technically, he was a very poor administrator. He practised favouritism, particularly in regard to employees from his own State. He made no effort to develop his subordinates. On top of it all, he believed in a policy of divide-and-rule. He tried to pit colleague against colleague, encourage throat-cutting competition and dominate the employees in such a way that it killed team spirit. There were three other superintendents attached to Mr. Grover. The superintendent-in-charge at the time of the interview was Mr. Rajnath. The supervisors

held him in very high regard and affection. They asserted that he alone was capable of improving the situation, provided "he does not kill himself in the process." One supervisor said, "Mr. Rajnath should be given the job of managing this plant with no limitations. If he fails, he should be replaced, but while he is trying to do the job he should be let alone." Rajnath had come from another industry and had been with the Rama Sugar Mills for about a year.

The supervisors also expressed themselves bitterly about the lack of co-ordination between sales and production. It was claimed that the sales group had the upper hand in production scheduling. Repeated examples were cited by production supervisors of wasteful production change-over on account of orders by the sales department. Production had to be adjusted every now and then to meet delivery schedules. Supervisors of the sales department, on the other hand, charged the plant people with failure to understand the importance of prompt deliveries in maintaining sales in a competitive market.

Some members of the sales staff were very critical about being denied responsibility. It was claimed that the policy decisions were made without their participation.

Comments on the organisation took several forms. One supervisor said, "The Company is not a team; rather it is a congress of individuals with no one at the top to pull them together." Some other supervisors complained of "too many departments... too much red-tape... too much paper work."

Most of the supervisors asserted that the top-management was also responsible for the present mess. The comments were as varied as they were numerous. "There is too much intruding by top management... very few ideas even penetrate

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the thinking of the top policy group... There is too much family spirit in this outfit... We have to work in the darkness. Policies are announced without advance notice and changed without warning. There were far too few foremen in the plant. The foremen were overworked. One particular foreman supervised workers on four different plants..”

Plant supervisors complained of their inability to carry out orders in disciplinary matters addressed to them because of last-minute changes in management policy. The example of a last-minute change in management policy on clean-up time allowance was cited frequently. Supervisors had initially been instructed to hold the workers to 12-minute clean-up time, and enforce the rule, with suspensions and warnings if necessary. When some suspensions were about to be made, the top management discarded the strict enforcement of the time-allowance rule. As one foreman put it: “The union took credit for this change of decision, although the union had nothing to do with this change.” This kind of action, it was claimed, undermined the confidence of supervisors in themselves and in the top management.

Some supervisors spoke of ‘the iron curtain’ between the plant and the front office. “The company had office supervisors working in the plant during the strike. No one from the front office even

came out into the plant to tell us they appreciated our loyalty. After all, it was no easy thing to walk across that picket line, especially when you know a lot of the men out there.” The same feeling was expressed by another supervisor, “I have been working for the company for over 10 years and no one has ever told me how I was doing on the job.”

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... And so arises the sorry and all too common dispute over, say, whether some unfortunate died needlessly on the operating table, and whether sorrowing relatives should have their sadness assuaged by gold. For the defence, Sir Theobald Rumbledon, MCh, FRCS, FRCOG, swears that the operation was wholly essential, expertly planned, and skillfully managed, and that death was the will of God and absolutely inevitable. For the complainants, Lord Betterman, MVO, TD, MD, FRCS, swears, under similar sacred oath, that the patient had been woefully misdiagnosed, that the operating theatre used was not fit for licensing as a slaughter house, that the grossest negligence had taken place, the crassest ignorance displayed, and a life sacrificed by sheer incompetence and stupidity. Neither 'expert', of course, having actually ever seen the real complainant—the late lamented one—at any time.—'New Statesman'.

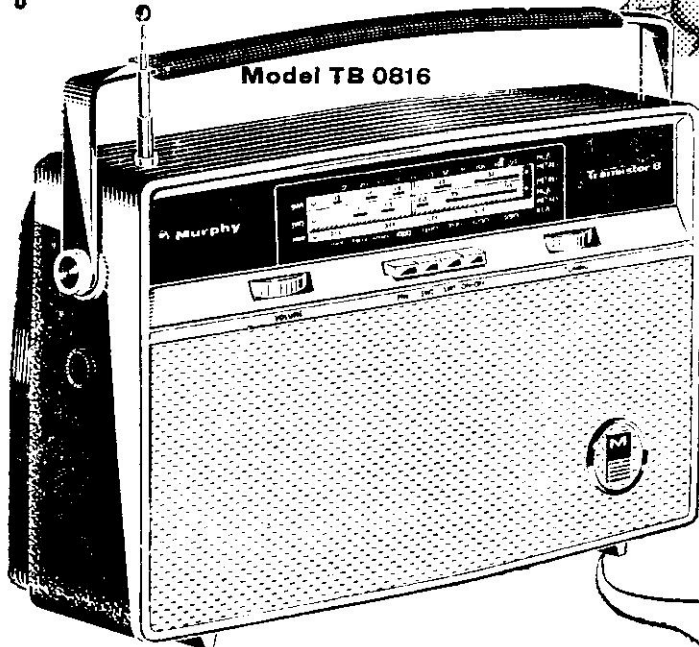
...When Lord Derby asked George V why he was so unkind to the future Edward VIII, the monarch's reply suggested that he regarded this as a law of nature: 'My father was frightened of his mother; I was frightened of my father; and I am damned well going to see to it that my children are frightened of me...—Paul Johnson.

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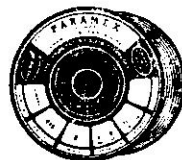
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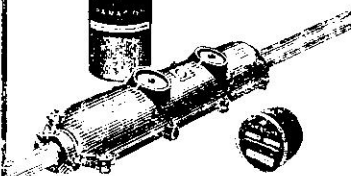


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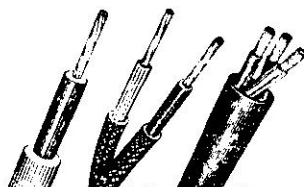
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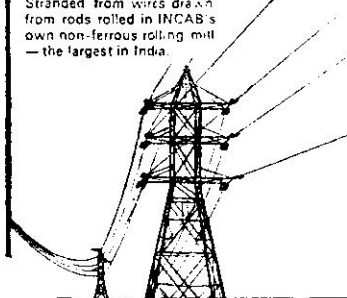


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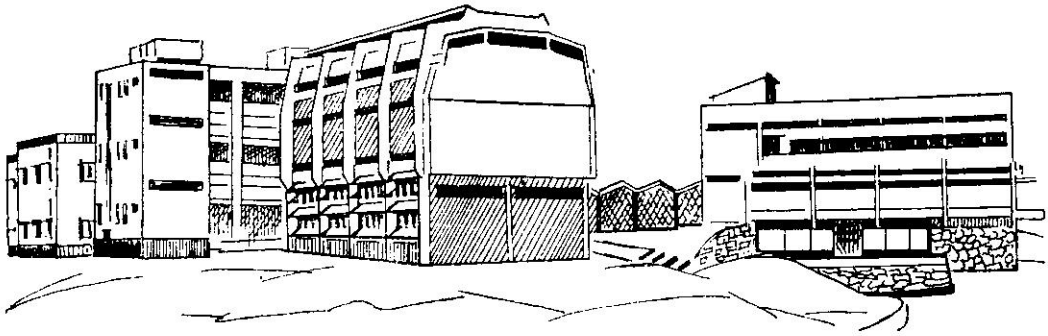
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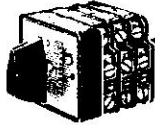
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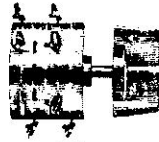


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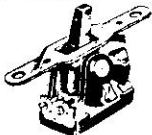
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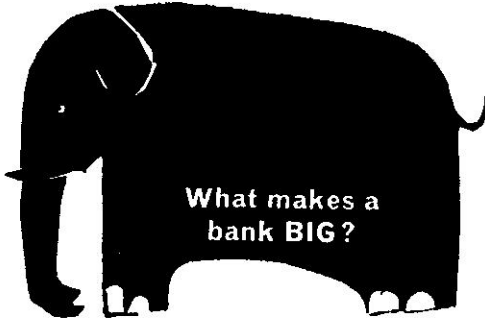
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Capital Structure and Reserves as on 31.12.1965:

Capital Authorised	Rs. 8,00,00,000
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Capital Called Up and Paid Up	Rs. 2,00,00,000
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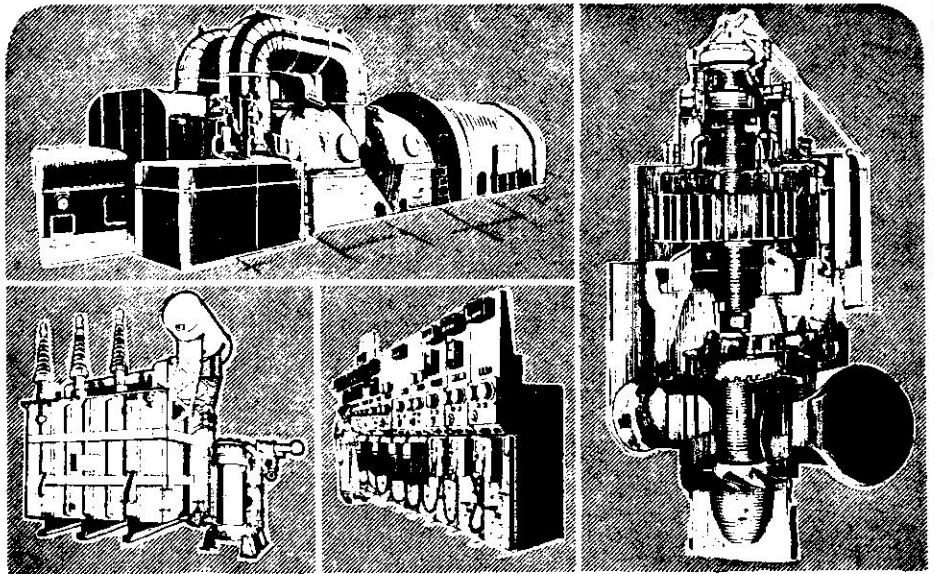
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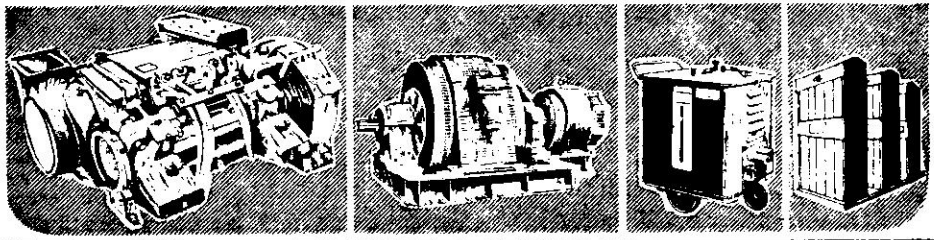
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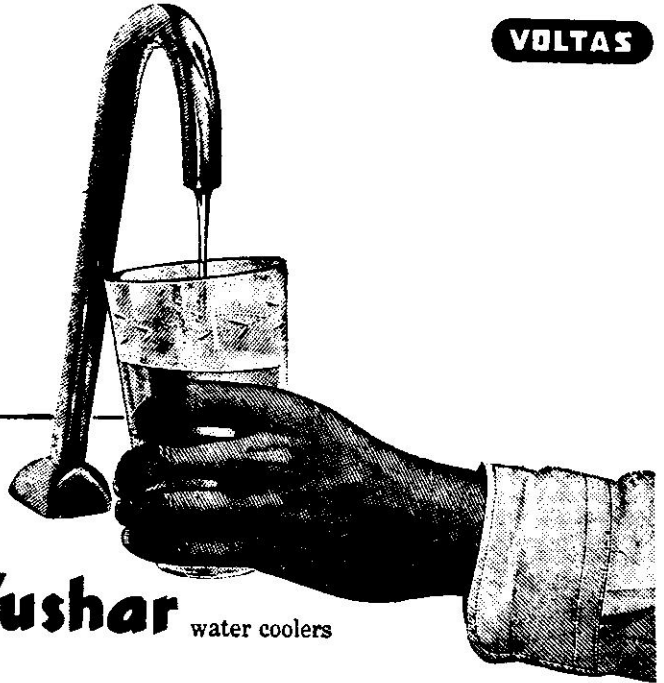
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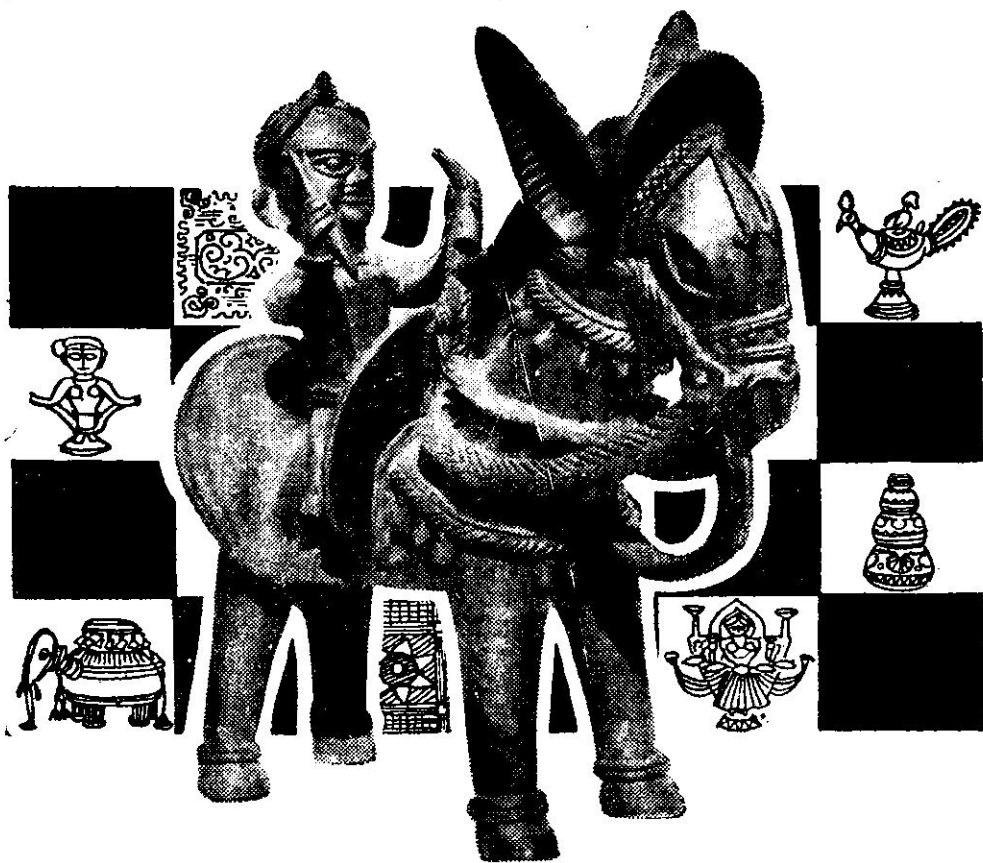
An NPC Publication

Role of Industrial Engineering in Productivity

This report contains the summary of the gains of productivity achieved by Indian firms through the application of industrial engineering techniques, besides the experiences of the NPC Study Team which visited the USA and Japan to study the functioning of Industrial Engineering Departments in the industries of those countries. There are recommendations in this Report relating to the organisation of industrial engineering departments, scientific work measurement, incentives, cost reduction programmes, etc.

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A New Publication

Productivity Is For You Too

By

K. Pennathur

In this volume, the author of *A Manual of Method Study* (National Productivity Council, 1966) focusses attention on the important fact that productivity is not somebody else's business, but everybody's concern. India's future depends on higher productivity in every field of life.

What is productivity? Is an integrated, cooperative, and humanised approach feasible in the quest for productivity? What are the guidelines for establishing a productivity department? In practical application, productivity assumes the form of certain techniques ranging from the simple to the sophisticated.

Krish Pennathur analyses the connotation of the term "productivity", dispels some of the popular misconceptions on the subject, and examines the aim, scope, and potentiality of productivity as applied to not only manufacturing processes, but also such spheres of economic and social activities as agriculture, administration, and public utility services. The many other areas that are of importance, and where productivity techniques can be applied with success, are carefully examined. The concepts bearing on the subject are described, and amplified by comparison, evaluation, and analysis.

Throughout the book, in a readable prose style, the author illustrates both theory and technique with a number of brief case studies. For courses in productivity, here is a text that is as exciting as it is thorough.

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Productivity Drive Makes Powerful Impact

HG GUTTAL

Officer on Special Duty

THE STRENGTH of a nation and the prosperity and well-being of her people depend largely on an optimum utilisation of the available resources for the production of an increasingly larger quantity of goods and services. Material prosperity can come about only through purposeful, effective and dynamic planning and orientation of our work methods: this is Productivity. A synonym for rapid economic progress and planned development, Productivity is a method rather than a doctrine, a way of life, and a continuing quest for the better way in every area of human endeavour.

The inception of the National Productivity Council in February 1958 marks the beginning of the nation's effort to introduce modern productivity techniques, particularly in the fields of Industrial Management, In-

dustrial Engineering, and Industrial Relations. With its tripartite character providing for representation for Management, Labour and Government, the NPC was able to enlist the support of all the major interests involved in the industrial sector. During the first few years, the NPC restricted its area of operations to training and service to industry, besides making efforts at generally propagating the message of productivity to the people. With the help of a team of competent Indian as well as foreign specialists in different subjects of productivity, NPC was able to organise a number of Training Courses, Seminars and Symposia, highlighting the benefits of productivity to the industry. In 1964, however, it was felt that an extensive nation-wide campaign might go a long way in ensuring for productivity the place that it richly deserves

in accelerating the pace of India's economic growth. Thus was born the idea of having a productivity year, which the National Productivity Council was quick to grasp and designate 1966 as India Productivity Year.

"The first thing to do," said Jawaharlal Nehru, "is to create an active atmosphere in favour of higher productivity and better techniques." Consistent with the spirit of this statement, the IPY, launched throughout the country in January 1966, adopted the following objectives:

- (i) To increase national awareness of the vital need of Productivity as the key to raising the standards of living of our people;
- (ii) To intensify interest in the applied aspects of Productivity in all the areas of endeavour; and
- (iii) To make productivity a quest of national concern.

While the programmes of NPC were hitherto beamed only to the industrial sector, it was decided to cover all the major areas of endeavour like Agriculture, Education, Commerce, Office Management, and Public Administration, as part of the IPY Programme.

To bring about a transformation in the attitude of the people towards the creation of wealth, the organisers of the IPY evolved an ambitious programme for developing the productivity drive into a national movement. Realising that this could not possibly be achieved without official and moral support at the highest level, they decided to approach the President and the Vice-President of India to extend their generous patronage to the IPY. Both the President and the Vice-President graciously consented to be the Patron and the Vice-Patron respectively of IPY-1966. For giving the people already engaged in the productivity effort a sense of participation, a top-level 80-member National Committee was set up with the Prime Minister of India as the President.

To carry the productivity movement to the States and local levels IPY State Committees were constituted with the Governors as the Patrons and the Chief Ministers as the Presidents. Working out of plans and programmes for IPY was entrusted to high-powered compact committees both at the national as well as the States levels, the IPY Working Committees and the Finance Committees being among the important ones. The National Committee held its first meeting in New Delhi on July 17, 1965 under the Presidentship of the late Sri Lal Bahadur Shastri; most of the State Committees had their first meetings a little earlier.

Nation-wide Programme

For evolving a nation-wide programme for the IPY and for directing, implementing, and coordinating the productivity drive, an IPY Secretariat was set up at NPC Headquarters. A comprehensive blue-print of the nation-wide programme was drawn up under the overall guidance of the Chairman and the Executive Director of NPC. After the blue-print was approved by the IPY Working Committee at the national level, it was adopted by similar Committees at the States level. The IPY Secretariat kept in continuous touch with the six NPC Regional Directorates, 47 Local Productivity Councils and several other collaborating organisations like the 69 Universities and thousands of Industrial establishments, directing and coordinating the IPY programme throughout the country.

The year 1966 turned out to be a rather difficult year for Industry and Agriculture. The year witnessed acute shortages of raw materials, spares, components, and foreign exchange. Failure of rains in the preceding year resulted in food and power shortages, which directly affected our industrial and agricultural turnover. Nevertheless, the productivity drive has had a powerful impact on the nation, inasmuch as thousands of industrial establishments enthusiastically supported and participated in the programmes of the IPY. Productivity

targets for achievement were set; Productivity Cells and departments have been established in individual industries and Productivity Surveys have been conducted with a view to bringing about an overall improvement in performance and turnover. Practically all Universities participated in the IPY by organising Essay Contests and Debates and by highlighting the concept of Productivity in their magazines and Journals. Thousands of people participated in the special training programmes, seminars and symposia organised as part of the IPY programme. In the field of agriculture, special training courses were organised in Farm Management and mobilisation of improved techniques for increasing the agricultural

yield. The increase in the demand for Training Programmes, Productivity Surveys in industries ranging from Sugar and the Rice Mills to Engineering goods, fertilisers, cement, etc., bears ample testimony to the new urge we have been able to generate in favour of higher productivity.

Thus, India Productivity Year which has come to symbolise the nation's determination to bring about an economic renaissance, is all set for ending on a note of crescendo, as rightly forecast by the Union Minister of Industry, Sri D Sanjivayya, when he inaugurated the national conference of Local Productivity Councils recently in New Delhi.

In a Decade, a New India

"At present world population growth regularly exceeds the most recent forecasts. In three years (1962-65) 170 million new mouths were opened. We have to imagine that Britain, France, Italy, Belgium, and Holland did not exist in 1962—but now they have appeared and must be fed. In a decade, it will be a new India", according to *New Statesman*.

The weekly adds: "... So much has been written recently about the 'population explosion' that we often forget how recent a phenomenon it is. We ought to remember, for the point is that we did not prepare for it, and still scarcely know how to meet it. It is a striking fact that the population of India fell between the 1911 and 1921 Censuses, and the first reports of a steep rise were obscured by war news (and the Bengal famine). It used to be assumed that poverty and hunger would threaten the peoples of the poor world with extinction; actually, the population of certain Pacific Islands did shrink drastically, and some remote African tribes are dying out even today. Catholics and Communists alike have only lately given up proving that Malthus was wrong..."

HIGHLIGHTS OF IPY IN THE REGIONS

This Section was really created to give opportunity for self-expression to Local Productivity Councils, for most of the material, printed in the following pages, has come from the LPCs, some from our own Regional Directorates also. Those who have written have really placed us under great obligation: the only constraint really was time, for most of the copy — as we call it in editorial jargon — came on or after the deadline — November 15, 1966, set by the rigidities of the printing process. Of course, the LPCs and our own Regional Directorates work under their own limitations. They are operative arms of the Productivity movement, and are manned by persons who are experts, not scribblers. They believe in working, and not in writing fine pieces — so, the material came in all shapes, sizes, and qualities: a plethora of printed material, programmes, brochures, catalogues, lists of distinguished names, etc. We have, in all good faith, used whatever we possibly could; and if any region or LPC has got excluded, it is by a purely statistical chance; and we mean to cover them all — literally, all and every LPC, in the coming issues, when in fact, we shall have more time and more space.

—Editor

SPLENDID achievements have been made by the Delhi Productivity Council in the various projects and programmes carried out by it during India Productivity Year-1966. The response of the various industrial units was highly commendable, and but for the cooperation of management and labour it would not have been possible to maintain the Year's momentum, and achieve positive success. A preliminary survey, conducted by the Council, shows that a large number of firms have directly benefited from the Year.

Presented below is a summing up of the results of DPC's survey: The Council

DELHI

initiated the Year by launching a special project in which nearly 650 students of the Delhi College of Engineering participated. They visited 200 industrial units in the Delhi region. Their reports show that there is a big scope for raising Productivity in small industries. The reports are being scrutinised by our Industrial Engineers, and necessary action is being initiated.

The projects relating to Production Planning and Control, Stores and Procedure at M/s M. C. Engg. Co. has resulted

in an increase of production in the unit by about 25 per cent. The rejection percentage of finished goods has been considerably brought down. The innovations on layout, etc., have given a modern look to the factory. An in-plant training course was arranged in the factory for supervisors and workers, and this was found useful by the management.

The project of Raw Materials Handling in the factory of M/s Amar Nath Bhaskar & Sons, Badarpur, will, it is hoped, result in a saving of Rs. 25,000 per year, with an initial expenditure of Rs. 12,000.

At M/s Lakshmi Engg. Works, the project on Plant Layout and Materials Handling would release 10,000 sq. ft. of area, which, in a place like Delhi, carries a high value. The project has resulted in a saving of Rs. 18,000 per year besides better utilisation of space and machinery, and less effort for the manual labour as a result of the use of handling equipment.

The methods and layout of the Capacitors Section of M/s Radiola Corporation have been improved. Two machines which were designed and put into operation have simplified the punching operation, thereby reducing the effort exerted by the workers. The operational time has also been reduced.

The methods and layout of the manufacturing shop at M/s Shourie Duplicators were improved. Stores Procedure was simplified, and introduction of the Kardex System was recommended. It is worth mentioning that some of the recommendations have been implemented, and the others are in the process of implementation.

The DPC had introduced improved techniques earlier at M/s Mckenzie Phillips. Spectacular achievements were made in their factory by producing the whole year's targeted production in six months. By way of gesture, the whole staff was given a week's holiday with a trip to Simla.

Contribution of Madras R.D.

...In 1959-60, the six Local Productivity Councils in the Madras Region conducted 20 training programmes for 338 participants. In 1966 the seven Local Productivity Councils presented 67 training programmes for 892 participants during the months of April to October alone.

The Madras Regional Directorate started functioning in 1958-59 with two specialists, and in July 1966 we had seven specialists to take care of the work, and the revenue has exceeded Rs. 10,000 per month in recent times.

The nature of work in this Regional Directorate is not significantly different from the work done in other regions, except that the Madras Regional Directorate made a uniquely significant contribution towards training of Industrial Engineers who are certainly going to play a very important part in our country's drive for higher productivity. It may be mentioned here that since 1962 as many as 78 engineers were given training in Industrial Engineering to enable them to work as Industrial Engineers in the NPC, LPCs, and Industrial undertakings.

I cannot close this note without making reference to the wonderful support received from the Government of Madras in carrying the message of productivity to different corners of the State. With assistance from the State Government most of the Local Councils have now employed Industrial Engineers. Certainly this will go down as an important landmark in the history of productivity movement in the State of Madras... — MS DUTTA, Ag. Regional Director, Madras Productivity Council.

The Managing Director of M/s Wireless House attended the Materials Management course. The programme has helped him to effect some changes in his purchasing policy. He is said to have been convinced that cash purchases are a safe mode of conducting business.

The Works Manager of M/s Payen Talbros (P) Ltd attended Seminars on Preventive Maintenance and the Role of Labour in Productivity. He feels that they are very educative. Most of the recommendations made at both these programmes have been put into practice.

Each machine is under the active observation of the maintenance foreman. Breakdown has been reduced by 50% during the year. Project report on Incentives is under consideration of the Management.

All films shown by the Council were appreciated by the management and workers.

The Production Manager expressed the following views:

- (a) **Good Housekeeping.** Besides implementing the steps contained in NPC bulletins, plant layout of the new factory has been designed on principles listed in them.
- (b) **Preventive Maintenance:** Machine utilisation has been increased by 15% and is expected to achieve a further increase of 30% by the end of the year.
- (c) **Wastage Reduction:** Wastage has been considerably reduced, and effective steps have helped to re-utilise the waste. Efforts are being made to effect reduction in waste in other areas.
- (d) **Absenteeism Reduction:** The percentage of absenteeism has been reduced to 7%.

At M/s National Radio Corporation, the Managing Director sponsored partici-

pants for the Supervisory Development training course. Twenty per cent of what they learnt is being put into practice. He is arranging a reading room in the factory so that the supervisory staff will read productivity literature and effect necessary improvements.

The Manager of M/s Matchless Industry of India found the training course on Work Study very useful. He has already prepared a plan to use the work study techniques during the next three months. He has found the bulletins useful, and hopes to adopt some of the productivity techniques in the new factory.

The Factory Manager of M/s Ganesh Flour Mills Co. Ltd. attended the DPC Seminar on the Role of Labour in Productivity. The Management follows essentially a middle path. A works committee was formed in May 1966. Incentives have been introduced on a direct system by which workers get increased payments based on increased production. The number of workers covered by this scheme has now been raised from 55% to 80%. This has helped in good relations with workers, and helped the management to increase production by 30% in the last 6 months.

The Seminar on Management Controls and Ratios has helped the Management to streamline the stores. The Management has planned to include the other areas of Production Control, Purchase Control, and Marketing in their development programme. As a result of perusing productivity literature, various steps have been taken as a result of which human relations have greatly improved, and inspection of incoming materials has been made strict. During the year about 20% Cost Reduction has been effected in the products—5% by way of Waste Reduction, 10% by redesigning the product group, and 3 to 5% by Absenteeism Reduction.

An Incentive Project was undertaken at M/s Murarka Engineering Works. It helped the management to achieve 20%

increase in Productivity in the first 6 months of the year.

A project on Inventory Control and Stores Reorganisation was carried out at M/s Modern Electrical Manufacturing Corporation. The recommendations are in the process of implementation.

The Personnel Department of M/s Indian Oxygen Ltd. has been arranging regular meetings on the monthly bulletins of IPY, and trying to educate the employees of the organisation. Since workers lose wages if they are absent off and on, an incentive has been offered to them that in the matter of promotions extra weightage will be given if their attendance record is good.

The workers and staff of M/s National Automotive Industries greatly appreciated the films on productivity. The Managing Director appreciated the 'Topic of the Month' bulletins, and has implemented some of the suggestions contained in them. This has enabled them to have a better control on work.

The Management of M/s Striplex Industry appreciated the monthly bulletins, and took further steps to reduce wastage this year. Some fuel-saving device has been made by this unit which has helped it to reduce fuel consumption by 10%.

The Works Manager of M/s Indian Refrigeration Industries attended the course on Materials Management, and found it of use to beginners. A film programme was arranged, and it was appreciated by the workers.

The Seminar on the Role of Labour in Productivity was attended by the Works Manager of M/s Wings Wear Corporation. The recommendations of the seminar are being put into practice by this progressive unit. The management found IPY literature useful, and made modifications in their system of work accordingly. They wish to introduce the incentive system in order to

motivate workers for increased production.

A partner of M/s Bhagsons Paint Industries attended courses on Inventory Control and Stores Procedure, Material Management, and found both useful. A project on Stock and Inventory Control has helped this unit in procurement and physical arrangement of stores, and simplified procedure for the issue of material. It has considerably increased their production.

M/s Hindustan Insecticides arranged six seminars and training programmes for officers and workers through the assistance of NPC and DPC. The workers programme in Hindi and Officer training course of two weeks gave them the necessary determination to achieve an all-time record of performance. The film shows have educated the workers and supervisors on the importance and value of productivity in their work. Here are the highlights of achievements of this Public Undertaking during India Productivity Year-1966.

1. A Technical DDT—1596 tonnes, i.e. 15% (approx.) over the 1965 figure of 1392 tonnes.

B 50% DDT—2903 tonnes, i.e. 23% (approx.) over the 1965 figure of 2368 tonnes.

2. The Productivity Incentives Scheme was introduced mainly to motivate the morale of the officers and workers to achieve target production for the year. They are closing the year with the targeted performance.

3. The Managing Director gave a token award of an alarm time-piece each to all employees in April 1966 for the all-time monthly record production of formulated DDT of 306 tonnes (50% more over the average of 218 tonnes of 1965).

4. The order from West Germany for Chloral Hydrate B.P. has been executed.

5. They have reported that they have developed import substitution with indigenous Hydrated Calcium Silicate in place

of Microcell-E used as anticaking agent. The process know-how and plant have been developed entirely within the country.

A four-week project on Time and Motion Study of the machine shop in M/s K. G. Khosla & Co. has resulted in establishing norms of production to enable the management to institute further incentive schemes for the workers. This was followed by an in-plant training course on Work Study to about 20 members of the Supervisory staff. This will equip them with the necessary know-how to have rigid control on the quality and quantity of their products as well. This has been greatly appreciated by the management.

A four-week project on Production Planning and Control and Stores Reorganisation was undertaken at M/s Gautam Electric Motors. The results are encouraging.

AUDIO-VISUAL SERVICE

The audio-visual service was intensified during the last six months, and has been directed particularly to workers in industries. The DPC arranged 80 film programmes, in about 60 industries, during the year. Over 7,500 persons took advantage of this service. This is a record feature of the Council's activities over the past seven years. This includes the support given by our film shows on the various 'Topic of the Month' programmes sponsored by N.P.C. The emphasis has been on Hindi films.

The DPC has arranged a competition of industries on subjects like Import Substitution, Cost Reduction, Waste Reduction, Reutilisation of Waste, Preventive Maintenance, Accident Prevention, and Capital Productivity. The assessment year ends on Mar. 31, 1967.

Fifteen industries have formed into a group to exchange information, and to solve their problems by the mutual exchange of experience, in regard to plant maintenance.

The DPC has helped in the installation of suggestion schemes in nearly 25 industries of Delhi, and it will evaluate its impact in course of time.

The Delhi Productivity Council took the initiative to avail of the services of two Japanese foundry experts for the benefit of its member industrial units. Their services were availed of by M/s Lakshmi Engineering Works, M/s Delhi Cloth & General Mills Co. Ltd., M/s Globe Steel Ltd., and M/s Ajanta Iron & Steel Co.

CALCUTTA

THE CALCUTTA PRODUCTIVITY COUNCIL was formed in July 1959 at the instance of the NPC which sponsored the setting up of Local Productivity Councils all over India as per their policy and programme. The objective set before the Local Productivity Councils was wide, and included the running of training programmes covering all aspects of Management in order to improve efficiency at plants and offices of our industries in both public and private sectors. The promoters of the NPC had in view that the LPCs would be the principally operating arms of the mother organisation, and would mainly organise training programmes to be conducted by NPC specialists, Indian as well as foreign. This Council as such confined its activities during the first two years mainly organising programmes initiated by NPC, and run by their specialists.

As the Council came to stay and gained experience in the field of Management training, it started developing activities of its own. These activities were programmed primarily in the context of the needs and special problems of industries in the Calcutta area. It was felt, for example, that the industries of this area needed short, introductory courses in large number for

their junior and middle cadres. Since the number of executives needing such training was large, it would have been difficult for the industries to spare them for full-time programmes. The Council as such developed part-time Appreciation Courses covering almost every aspect of Management (such as Work Study, Management Accounting, Production Management, Executive Development, Personnel Management, Higher Financial Control & Cost Accounting, Office Organisation & Methods, Sales Management & Market Research, Company Secretarial Practice, Production Engineering & Tool Design, Purchasing Store-Keeping & Inventory Control). Since the number of specialists available from NPC was not adequate to run so many programmes, which came to practically one every month, the Council took the assistance of local talent available in industries and professional institutions. These programmes were conducted mainly in the evenings for about 2½ hours. Each programme is of 30 hours' duration covering 12 evenings. The programmes have received wide response from industries of this zone. Since July 1961 this Council has run about 55 such programmes at the rate of 11 per year. About 2,000 executives from industries have attended these programmes.

The Council also felt that there was a growing need for extending elements of management know-how to organisers of Trade Union Movement. It was felt that the failure of management and labour to understand each other was at least partly responsible for the number of strikes and lock-outs that took place in this region. It was felt that an effort should be made to acquaint the Trade Unionists with Management's objective as well as language. It was, therefore, decided to run a series of training courses in Bengali and Hindi on the different aspects of management know-how specially for the Trade Union organisers. These programmes started in 1962; this council have so far conducted twenty such programmes, in which the four Central

Trade Union representatives in this Council have fully cooperated by sponsoring as many as three hundred trade Union organisers. These courses are run free, and no charges are made for the stationery, lunch, refreshments, etc., provided during the course. In running these programmes the Council have mainly depended on the NPC specialists. Specialists from industries were also invited from time to time to participate in these programmes. The programmes have been run on following subjects:

1. Work Study
2. Wage Administration
3. Industrial Relations
4. Office Organisation & Methods
5. Industrial Accounts

The Council made a substantial contribution in the field of management training by being the first in India, to present refresher programmes on technology for the technicians in industries. While training programmes for senior executives always dealt with management subjects, it was felt that programmes should be organised to bring to the technicians in industries the developments taking place in the field of technology. This Council approached Jadavpur University, a premier institution in technology in eastern India, and the Indian Statistical Institute to lend their know-how for running programmes on subjects such as Protection of Metal, Techniques of Metal Cutting, and Statistical Quality Control, to bring to the Engineers and Technicians up-to-date information on the developments taking place in advanced countries. These programmes were started in 1962. So far, the Council has run about 35 programmes, with about 500 participants. The response received confirms that the programmes have been very useful to the industries. The following subjects have been covered: 1. Material Handling; 2. Jigs & Fixtures In Quantity Production; 3. Heat Treatment; 4. Metrology; 5. Hot & Cold Workings of Metals; 6. Surface Protection of Metals;

7. Unit Operation of Fluid Flow under Steady Conditions; 8. Basic Techniques of Metal Cutting; 9. Workshop Practice; and 10. Statistical Quality Control.

The Council also presented for the first time a residential programme for Top Executives at the Oberoi Mount Everest Hotel, Darjeeling, from May 1 to 10, 1966. The programme, which has been described as a Residential Laboratory for Organisational Development for Senior Executives, employed up-to-date techniques of Group Dynamics known as the Sensitivity Techniques and aimed at re-orientation of the participants' attitudes and values. The programme was conducted by Senior Specialists, Indian and foreign, and was well received. It was attended by Senior Executives of industries from different parts of the country.

The Council has also been organising for the last 4 years Seminars and Symposia of short duration, specially designed to meet the needs of the busy executives. Conducted by senior specialists from NPC, industries and professional institutions, these programmes attempt to highlight important aspects of some of the present day management problems. So far, 26 Seminars were held on subjects such as Purchasing, Store-keeping & Inventory Control, Methods Time Measurement (M.T.M.), Operations Research, Cost & Budgetary Control, Materials Management, Marketing Management & Techniques, Motivation & Morale in Industry, Preventive Maintenance, Office Management (Symposium), Management Accounting, Project Evaluation & Review Technique, Organisation & Methods, and Work Study for Jute & Textile Industries.

A series of Lecture Meetings, Tea Meetings, and Conferences of about 3 hours' duration in the evening, are also regularly organised by the Council, for which no fees are charged.

Besides, the Council has continued to run the usual full-time programmes offered by the NPC and run by their speci-

alists. Usually, the number of programmes run by the Council are as many as 40 per year, besides Film Shows and Lecture Meetings which are usually organised free of charge. In the current year (IPY), NPC offered a large number of special programmes called IPY National Training Courses and National Seminars, and this Council conducted them all, along with its own programmes. The commitment for the year for this Council is to run about 60 training courses, seminars, etc., three-fourths of which have already been executed successfully.

At the instance of the National Productivity Council's then President, Shri Manubhai Shah, the Council had organised a Consultancy Service in 1961. The programme received fair response, and would have developed in due course. However, it was felt that since NPC's P.S.I.S. scheme was now being organised on proper lines and effectively, it was not necessary to run a duplicate service by this Council, and that this Council should devote itself to advancing the P.S.I.S. Programme. As such the Calcutta Productivity Council's Consultancy Service Programmes have now been merged with the P.S.I.S.

The Council publishes a bimonthly Newsletter and a Deluxe Annual Number of about 150 pages. The latter is very well received by industries, and is considered an excellent effort in the field of management journalism.

Continued membership drive for the last 7 years has now placed on Calcutta Productivity Council's roll about 250 organisations (including almost all the top industrial and professional institutes of Calcutta area), besides about 250 individual members.

The Council has now purchased a plot of land measuring about 1/3rd of an acre very near to Goal Park in the South Calcutta, and is planning to erect its own building.

DURING IPY-1966, the Productivity Movement in the Kanpur region made a significant break-through into new areas, particularly the Agricultural sector. In the industrial sector, which continues to be its mainstay, the progress is evidenced by an increasing number of requests both from public and private sectors for organising training programmes. These have been in the nature of in-company and industry-based training programmes.

A growing awareness has come about on the part of the Managements to train their staff at all levels in the application of Productivity Techniques for improving their performance, and establishing and maintaining the quality of their products. Competition has forced the hands of industries to become productivity conscious. Even in the case of Government and Semi-Government departments, the urge for productivity

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has been more than visible. Several training programmes tailored to their needs have been organised. The efforts of Local Productivity Councils in organising seminars and conferences on various aspects of productivity have generated consciousness, and drawn in their fold all sections of society.

PSIS has proved to be a valuable instrument for rendering service to Industry. This is now recognised by industry as something both of immediate and ultimate benefit, and one which can demonstrate, in tangible terms, the value and the effectiveness of productivity techniques.

While generalised training programmes still carry their hallmark they are being replaced by the programmes organised within the company premises, and on company time. These programmes have a

motivating value. They have created a sense of confidence and recognition on the part of trainees. It is also reflected in the progressive nature of management and its positive impact on the psychology of the technicians employed in the industry.

By far the largest demand for training activities has been in the field of Supervisory Development and the Worker & Development Programmes. Despite a country-wide network of Worker Education Centres, and their specialised services in the field of Training of Worker-Teachers, the NPC programme on 'Worker & Productivity' has evoked considerable interest and enthusiasm. In one sense, it can be said that as compared to all other training programmes this single programme has outstripped the demand for in-company training programmes. Almost all Local Productivity Councils and large-size units are anxious to have this programme carried out for the benefit of workers.

During IPY-1966 we conducted in the region 5 intensive Productivity Surveys, and 28 Training Programmes out of which two were National Seminars (one on the Role of Labour in Productivity and the other on Fuel Efficiency), followed by an intensive training programme on Fuel Efficiency. Sixteen Seminars have been so far organised on various aspects of Productivity. (This, however, gives an account of IPY activities only up to the end of October 1966)

The following regional training programmes have been so far organised:

1. Method Study and Materials Handling: Agra PC.
2. Training Within Industry: Indian Oxygen, Kanpur.
3. Labour Legislation and Grievance Procedure: Jabalpur Local Council.
4. Executive Development: Institution of Engineers, Bilal.
5. Production Management: Eastern U.P. Productivity Council.

6. Personnel Management: Rohilkhand Productivity Council.
7. Discipline in Industry: Western U.P. Productivity Council, Dehra Dun.
8. Labour Legislation & Grievance Procedure: Eastern U.P. Productivity Council.
9. Inventory Control: Western U.P. Productivity Council, Meerut.
10. Inventory Control: Rohilkhand Productivity Council.
11. Discipline in Industry: Agra Productivity Council.
12. Industrial Relations: Agra Productivity Council, Firozabad.
13. Discipline in Industry: Rohilkhand Productivity Council.

Training Programmes on Worker & Productivity were organised at a number of places:

Rampur (Rohilkhand Productivity Council); Kanpur at the request of M/s. Cooper Allen Branch of British India Corporation; Katni (Jabalpur Productivity Council); Baheri (Rohilkhand Productivity Council); Naini, M/s. General Electric, and Swadeshi Cotton Mills; Bhilai (Bhilai Technical Institute); and Mathura (Agra productivity Council). At Firozabad (Agra Productivity Council) a Programme on Industrial Relations, and at Daurala (Western U.P. Productivity Council) a programme on Worker Development Programme were organised.

Supervisory Development

Supervisory Development Programmes were also conducted at some places in the Region. Kanpur had national seminars on Fuel Efficiency; Role of Labour in Productivity; and Voluntary Labour Arbitration. At the All-India Oil Technologists' Conference, held at Kanpur, Sri A. N. Saxena contributed a paper on 'Productivity—Its Prospects and Perspective in Edible Oil Industry'.

A number of State-level Seminars were also organised: Apprenticeship Training (Department of Labour and Employment, U.P.) at Kanpur; Agricultural Equipment (Agra Productivity Council); Incentives for Higher Productivity (M.P. State Productivity Council) at Indore; Engineered Agriculture (U.P. Agricultural University) at Pantnagar; Conference for Industrial Promotion (Merchants Chamber) at Kanpur; Post-Devaluation phase and Industrialisation (Central U.P. PC) at Lucknow.

There were, besides, quite a large number of local seminars: Cyclization Reaction (Science and Technology Society) at Kanpur; Ergonomics (Central U.P. Productivity Council) at Lucknow; Conciliation, Mediation and Arbitration (Rohilkhand Productivity Council) at Rampur where a seminar on PERT was conducted by Prof. N. S. Ramaswamy of the University of Bombay; Wastage Reduction (Western U.P. Productivity Council) at Meerut; Absenteeism Reduction (Rohilkhand Productivity Council).

The following PSIS assignments were undertaken:

(a) Workload study in Ringframes in M/s. Elgin Mills, Kanpur; (b) Work Study in Warehouse of M/s. Elgin Mills, Kanpur, (c) Discussion at M/s. Carew & Co., Rosa, with management regarding the scope of study of their problems, (d) Discussion with the management of Western India Match Co. Clutterbuckganj, Bareilly, regarding survey of their works, and (e) Workload study in M/s. Associated Cement, Kymore.

Some of the LPCs organised Workers' Rallies: The Agra Productivity Council at Agra and Firozabad; Kanpur Productivity Council at Kanpur; At Kymore, Bhilai and Indore in Madhya Pradesh.

Exhibitions were also organised: an exhibition on Agricultural Equipment at Agra by Agra Productivity Council. In fact, every opportunity was availed of to propagate Productivity. In the exhibition

on Family Planning at Agra, the Agra Productivity Council took a stall for Productivity exhibits. The Western U.P. Productivity Council organised an exhibition stall of IPY-1966 at Nauchandi Fair.

The Daily Telegraph (Kanpur) published a special supplement on India Productivity Year on the occasion of the inauguration of IPY by the U.P. State Committee, and another on the occasion of the anniversary of the Kanpur Productivity Council. Sri A. N. Saxena delivered a talk on 'Utpadakta Kaise Badhe' from the Lucknow Station of AIR.

Objectives Explained

The inauguration of IPY at the State level was performed by Sri Biswanath Das, Governor of U.P., at Kanpur, on January 7 under the auspices of the Kanpur Productivity Council. The meeting was presided over by Shri S. P. Gupta, Chairman, State IPY Committee and Dy. Minister of Industry and Home, U.P. At the end of the function that had an impressive gathering of about 300 representatives of various industries, including Government officials, Sri Arjun Arora, MP (Labour Leader), proposed a vote of thanks. At Lucknow, IPY was inaugurated by Sri S. P. Gupta. The meeting was addressed by Brig. Pennathur, and Sri A. N. Saxena.

At Mathura, the District Magistrate inaugurated the IPY at a gathering of about 100 representatives of industry, labour and Government. Local industrialists also addressed the audience. At the end of the function Sri M. M. Agarwal, Secretary, Agra Productivity Council, explained the objectives of IPY, and the future activities to be taken up in connexion with IPY.

At Agra, IPY was inaugurated at the Senate Hall of Agra university by Sri Jagjivan Ram, Union Minister for Labour, Employment and Rehabilitation, Sri Banarsi Das, Minister for Labour, U.P., and Sri S. P. Gupta, Dy. Minister for Industry, U.P.,

addressed the gathering. Literature in connection with IPY activities was displayed.

Under the auspices of the Eastern U.P. Productivity Council, Sri A. N. Saxena inaugurated the IPY at Gorakhpur. The meeting was presided over by Sri Surendra Singh Majithia. More than 60 persons, including Government officials, participated in the function. Under the auspices of the Rohilkhand Productivity Council, IPY was inaugurated by Sri A. N. Saxena. The function was attended by over 40 representatives of top management, labour, and Government.

The Western U.P. Productivity Council launched IPY activities in its area, on a big scale, by organising a function at Meerut. This function was inaugurated by Sri T. N. Singh, Union Minister for Iron & Steel.

In Madhya Pradesh, a State-level inauguration of IPY was performed by the Governor, Shri K. C. Reddy, at Raj Bhavan, Bhopal. The State Productivity Council launched the IPY activities through its local Committee functioning at Jabalpur and Raipur (Bhilai) by organising training Programmes, talks and seminars.

Seminar on Incentives

The Indore Productivity Council intensified IPY activities by organising a top-level seminar on Incentives for Productivity, and succeeded in associating important industrial units of this area. This function was presided over by Sri S. B. Lal, Labour Commissioner, and inaugurated by Sri Tej Kumar Sethi, Managing Director, Binod Mills, Ujjain.

Industrial Units

The following industrial establishments launched IPY by organising meetings and displaying IPY publicity material:

Uttar Pradesh 1. L. H. Sugar Factory & Oil Mills, Pilibhit; 2. L. H. Sugar Factories &

Oil Mills, Kashipur; 3. Kesar Sugar Works Ltd., Baheri; 4. Swadeshi Cotton Mills, Kanpur; 5. J.K. Iron & Steel Co. Ltd., Kanpur; 6. Ganesh Flour Mills, Kanpur; 7. Cossul & Co., Kanpur; 8. Charan Safe Works, Kanpur; 9. National Metallurgical Corporation, Kanpur; 10. Singh Engineering Works, Kanpur; 11. Kamla Engineering Works, Kanpur; 12. Geep Flash Light Co. Ltd., Allahabad; 13. General Electric Co. of India Ltd., Naini; 14. Carew & Co. Ltd., Rosa; 15. Indian Oxygen Ltd., Kanpur; 16. Eveready Flashlight Co., Lucknow; 17. Amitabh Textiles Ltd., Dehra Dun; 18. Miniature Bulb Industries, Dehra Dun; 19. Shirali Motors, Dehra Dun; 20. Allied Industries, Dehra

Dun; 21. Bharat Heavy Electricals, Haridwar.

Madhya Pradesh 1. Associated Cement Co., Kymore; 2. Burn & Co., Jabalpur; 3. Perfect Potteries, Jabalpur; 4. Institute of Metals, Bhilai; 5. Iswar Industries, Niwar; 6. Alembic Industries; 7. Heavy Electricals, Bhopal; 8. M.P. State Road Transport Corporation, Bhopal; 9. National Newsprint and Paper Mills Ltd., Neapanagar; 10. Satna Cement Works, Satna; 11. Asbestos Cement Ltd., Kymore; 12. Binod & Deepchand Mills Ltd., Ujjain; 13. Orient Paper Mills Ltd., Amlai; 14. Other institutions and organisations.

SEMINARS AND SYMPOSIA

In the Northern Region, IPY inaugurations at the State level were held at Jaipur, Chandigarh, and Srinagar by the Rajasthan State Productivity Council, NPC Regional Directorate, Ludhiana, and J & K Productivity Council, respectively. Dr. Sampurnanand, Governor of Rajasthan, Sri Ujjal Singh, Governor of Punjab and Dr. Karan Singh, Governor of J & K, inaugurated the functions respectively. Sri Mohan Lal Sukhadia, Chief Minister of Rajasthan, Sri Ram Kishan, Chief Minister of Punjab, and Sri GM Sadiq, Chief Minister of Jammu & Kashmir, presided over the respective inaugurations. Dr PS Lokanathan addressed the inaugural function at Chandigarh. Brig. K Pennathur and Dr OP Misra, Regional Director, NPC, Ludhiana, addressed the audience on these occasions.

Similar inaugural functions were held under the auspices of the Local Productivity Councils at Amritsar, Jullundur, Batala, Faridabad, Jammu & Kashmir, Sonapat, Ludhiana and Delhi. In addition,

68 industrial units, Government departments, universities, and colleges organised IPY inaugural functions. A rough estimate of the number of participants who attended the inauguration of IPY may well be put at 6,000.

The Regional Directorate organised programmes on the Topic of the Month, as decided upon by the National Working Committee of India Productivity Year. Programmes were organised throughout the Region on the following subjects:

1. Good Housekeeping.
2. Preventive Maintenance.
3. Wastage Reduction.
4. Absenteeism Reduction.
5. Suggestions Scheme.

About 3,600 participants from amongst workers, supervisors, technicians, and managers attended these programmes which were organised in the States of Punjab, Rajasthan, and the Union Territory of Delhi.

About 65 training programmes were organised, with about 5,000 participants, more than half of whom belonged to the small industry sector. The Regional Directorate organised six programmes on Workers' Development. In addition more than 3,600 workers attended the TOPIC OF THE MONTH programmes. The Jammu & Kashmir Productivity Council also organised two training programmes during IPY-1966, besides IPY inauguration at the State level.

Productivity Surveys

During the year, 41 Productivity Surveys were conducted in the various industries covered by the Regional Directorate. The Surveys were conducted in the agro-based industries, public-sector enterprises, and a number of private industries meeting defence and other essential requirements. Notable among these were:

M/s Hindustan Housing Factory, Delhi.

M/s Man Industrial Corporation, Jaipur.

M/s AN Bhasker & Sons, Delhi.

M/s Radiola Corporation, Delhi.

M/s Bhupal Mining Works, Bhilwara.

M/s Associated Cement Companies.

M/s Hindustan Twyford Limited, Bahadurgarh.

M/s Shourie Office Equipment P. Ltd., Delhi.

A really significant feature of the Year was the formation during the year of an INDUSTRIAL ENGINEERING CELL at M/s Man Industrial Corporation, Jaipur. The Cell has started systematic studies of the Plant under the guidance of the Industrial Engineer, Jullundur Productivity Coun-

cil. M/s Sigma Steel Industries, Ludhiana, have set up a Production Committee consisting of representatives of Management and labour to launch Productivity drive in the plant. They have decided to set up the following Productivity targets:

(i) To achieve 100% increase in overall Productivity.

(ii) To find out ways to substitute scarce imported raw material used by them.

The company is an Agro-based Industry manufacturing power sprayers and plant protection equipments. The company was experiencing a bottleneck in its turning capacity. A thorough study of the manufacturing methods done by an NPC Specialist showed that production could be increased with the same turning capacity by improving methods and tools. It was proved that without any adverse effect on the utility of the product, a few parts could be eliminated and cheaper material substituted for dearer imported brass.

This unit also received Merit Award under the Industrial Merit Award Scheme sponsored by Government of Punjab (Department of Industries) in association with the National Productivity Council.

At M/s Amar Mechanical & Engineering Works, Ludhiana, a large unit manufacturing lathes and planing machines, we detected that about 40 per cent of the labour hours in the assembly department were being wasted as a result of defective machining at the manufacturing stage. This was quite an eye-opener for the management who had the impression that the bottleneck was in the assembly department only. This survey showed that Productivity could be increased manifold by organising the manufacturing department, production and planning department and manufacturing the proper tools and equipment.

The management of Messrs Gurmukh Singh & Sons of Ludhiana, automobile spare-parts manufacturers, desired to shift the factory to a new site to offset congestion and for further expansion. When approached for a comprehensive layout of the new factory, NPC also studied its manufacturing methods and equipment. It was found that with the application of improved methods and new machinery, the firm needed to augment their present fleet of machinery by only 70% to get an increased production of 3½ times. This study also revealed the improvement of productivity in quite a number of operations by several times the present rate.

Pilot Projects

As a part of the impact programmes of the Jullundur Productivity Council for propagating the techniques of Productivity, their Industrial Engineer conducted the following Pilot Projects. These projects were selected on the basis of visits to the industrial units, giving a two-day-week free service to about 200 units. Of these, Messrs Victor Tools Corporation of Jullundur is a good sample of a small scale unit employing below 50 workers and manufacturing hand-tools. A large proportion of these tools is exported. An eight-week PSIS was conducted in this unit, with two representatives of the firm being associated with the work. Investigations of the utilisation of the present equipment of the factory was made by Work Sampling (Activity Sampling) techniques. On this basis it was found that there was considerable scope of improving the productivity of the forging section which was the heart of the factory. Specific suggestions were made and on-the-spot guidance was given to improve the situation. Implementation of the measures have already resulted in increase of productivity of the forging section by 20%. There is a promise of additional 50% increase after implementation of other measures, currently in hand, by the management.

Messrs National Brass Engineering

Foundry of Jullundur city is another small-scale unit employing less than 50 workers and manufacturing W.I. Split Polleys and Pillar Drilling Machines. The Unit exports about 20% of its annual turnover. A one-month Productivity Survey was conducted for detailed investigation of the work done and concrete recommendations were made to improve production from existing machinery and men. Specific directions were given on the following lines:

- 1 Use of forging instead of rolled bar for one component to reduce material and processing cost.
- 2 Use of proper grade of tools for different materials.
- 3 Standardisation and simplification of designs of the products for economic manufacturing.
- 4 Balancing of output by production line techniques.

The tangible benefits of some of the recommendations were actually demonstrated during the project work itself, so that production in one section increased by 20% during the very first month. A further potential of 30% improvement is being realised through implementation of suggested measures.

The Industrial Engineer also conducted the following Pilot Projects:

- 1 Integrated Production on Management Project at M/s Guru Nanak Mercantile Company, Jullundur City.
- 2 Plant Layout Project at M/s Kalsi Metal Works, Jullundur City.

The Council claims that as a result of the implementation of the recommendations of the Pilot Projects, 10 to 40 per cent increase in productivity has been effected in the units covered by the Projects.

Fairs, Exhibitions & Merit Award

Another important activity during IPY is the organisation of Industrial Exhibitions at Simla and Ludhiana and an Agricultural

Fair at Jaipur. The Regional Directorate had put up pavilions at these exhibitions, which were organised by the Department of Industries, Government of Punjab. The theme of the NPC Pavilion was PROSPERITY THROUGH PRODUCTIVITY. The exhibitions at Simla and Ludhiana were opened by Sri Ujjal Singh and Sri Dharam Vira, successive Governors of Punjab. Our stalls were also visited by the two Governors. About 3,000 persons visited the NPC pavilion at Ludhiana. The three-dimensional scale model of Systematic Plant Layout was appreciated by all.

The Agriculture Fair at Jaipur has NPC posters and hoardings depicting the concept of Productivity, at important places in the fair.

Merit Awards

The Directorate of Industries, Punjab, instituted a scheme of Industrial Merit Awards in consultation with the NPC Regional Directorate at Ludhiana. Dr OP Misra, Regional Director, was among the Panel of judges and the awards were distributed to industries by Sri Dharm Vira, Governor of Punjab. Recipients of the awards included a factory (Sigma Steel) where NPC has done intensive PSIS.

During IPY, at the instance of the Regional Directorate and Local Councils, the Universities of Udaipur, Jodhpur, and Delhi organised debates and essay competitions on the subjects having a bearing on Productivity. The winners were awarded prizes on these occasions. Other universities are also scheduled to organise these competitions during the current year.

Incountry Teams

Five incountry teams on important subjects—Utilisation of Waste, Quality Control, Machine Tool Industry, etc.,—were either sent out or visited this Region.

About 40 seminars, symposia, and talks were organised during the Year. Some of

the topics of seminars were: Advanced Packaging Techniques in Japan, Export Marketing, Fuel Efficiency (National Seminar), Productivity in Building Industry (National Seminar), Public Accounting, Storage and Distribution of Agricultural Products, Agricultural Marketing, Role of Labour in Productivity, and Farm Mechanisation.

Newspapers like *The Tribune*, *The Hindustan Times*, the *Daily Telegraph*, and *The Times of India* brought out either special supplements or made significant editorial comments regarding IPY.

Radio Broadcasts

So far, 15 radio broadcasts were made in English, Hindi and Punjabi. Brig. K. Pennathur gave a number of talks over AIR, New Delhi, on important subjects like Preventive Maintenance, and Wastage Reduction. Dr OP Misra, Regional Director, gave talks in Punjabi from AIR, Jullundur, on "Sada Nagrik Morchaupaj Badhana" and "Badhik Utpadan wich he Sada Kalian Hai."

Broadcasts on Productivity subjects were also made from AIR, Jaipur. In addition, AIR covered the news of inaugural functions at New Delhi, Jaipur, Chandigarh, and Srinagar. The newspapers equally covered various news items and important activities organised by the Regional Directorate during IPY. For covering IPY programmes through Press and AIR, a number of press conferences were held at different places.

To spread the message of Productivity to every nook and corner of the Northern Region, numerous film shows were held.

There has been over the years a strengthening of the position of LPCs in the Region.

Another notable feature of the Productivity Year is that industrial membership of the Jullundur Productivity Council has now reached a peak of 127.

REPORT FROM AMRITSAR

January 1966

THE AMRITSAR PRODUCTIVITY COUNCIL answered the call of the IPY. It was duly inaugurated, and functions were arranged in the member-units. Sale of IPY stickers, lapel buttons, and flags was organised: the Council was able to sell a substantial number of stickers and lapel buttons at Amritsar. Posters, such as "*Let us vote for Productivity*", were widely circulated. Audio-Visual programmes were arranged at a number of places where senior Government representatives, workers, and businessmen participated; and short speeches were also delivered.

February

Literature on the IPY slogan "Waste reduction is productivity" was distributed amongst the local members and non-member units, along with the News Letter issued by the Council.

March

A training course on "Cost Reduction Technique" was organised in Amritsar, and literature on the IPY Year distributed. Film shows were arranged in different factories where the managements and workers participated.

April

The sale of IPY Stickers and Lapel Buttons was pushed forward, and wide publicity was given to the Productivity Year. Film shows were also arranged in Chheharta which is the biggest labour centre in Amritsar.

May

IPY-1966 Calendar was distributed to the members and non-members in the city, along with other literature. A Film show on 'Fuel Efficiency' was arranged.

June

Literature received from Headquarters was distributed, and the Council Bulletins were published describing the significance of the IPY symbol, etc.

July

A training course on 'Good House Keeping' was arranged at three different centres, including the Northern Railway Locomotive Workshop and the Labour Office. Film shows were also organised. Literature on 'Good House Keeping' along with other literature received from the N.P.C. was freely distributed.

August

A two-day Impact Training Course on 'Preventive Maintenance' was conducted in the premises of a member unit. Training courses were also conducted at the Punjab Institute of Textiles & Technology, and the Dayanand Polytechnic Institute. The folder on 'Preventive Maintenance' was freely distributed among members and non-members.

September

Talks were arranged on 'Cost & Budgetary Control' in different units. Film shows were arranged for the benefit of the workers. Literature received from the N.P.C. and a Folder on 'Waste Reduction'

along with the literature issued by the Council was freely distributed to the members.

At the time of writing, the Council has plans for the last quarter of IPY; and it is expected that business and industry will celebrate the concluding phases of IPY in a fitting manner.

AGRA

THE Agra Productivity Council took active steps to observe India Productivity Year-1966 in a constructive manner. Sri Jagjivan Ram, Minister of Labour and Employment, inaugurated IPY at Agra on Feb. 5, 1966. Thereafter, the inauguration was done at Mathura, Aligarh, Etah, and Mainpuri. During IPY, this Council has devoted its energies to establishing contacts with farmers as well. Apart from Seminars on Agriculture and exhibition of improved type of agricultural implements, demonstration was given to farmers as to how agricultural yield could be increased. The assistance of Sri Bikram Singh, progressive farmer, was sought for giving advice to farmers by demonstration on the use of hybrid maize seeds and sonaro wheat. An intensive programme was chalked out to show farmers how to improve yields during the coming crop. The attention of the State Government has been drawn to the delays in energising tubewells, and constant contact is being kept with the agricultural department.

A significant point during India Productivity Year was the reorientation of programmes for workers.

Worker-Hero contest was organised with the cooperation of the management. Prizes were distributed to workers adjudged 'Heroes'.

Rallies

Independence Day was celebrated on a grand scale as Productivity Day. More than 5,000 workers participated in the programme. Productivity contest, cultural show, film show and prize distribution were the main features of the programme. IPY Badges, IPY Flags, IPY Stickers, IPY Calendars and IPY publications have been popularised and sold to the members. Essay contests and debates are to be organised by the Universities of Agra and Aligarh in December 1966. Three cash prizes of Rs. 100, Rs. 75 and Rs. 50 each would be given to the first three candidates of each University in essay contests. Books on productivity are to be given for debates.

A number of rallies have been organised throughout the region, and a new slogan of "Produce and Prosper" has been popularised.

IPY activities have been published in the daily newspapers *Amar Ujala*, *Ujala*, *Sainik*, *Yuvak*, and the *Swaraj*. The IPY message has been conveyed to a large number of institutions, clubs and societies which have been enthused to intensify their activities during IPY. An exhibition was organised for a fortnight, displaying publicity materials, reports, charts books, and other literature on Productivity.

The motto of the Agra Productivity Council is: 'When we preach Productivity, we must practise it'.

SATARA

IPY HAS BEEN a lucky year for the Satara Productivity Council, which moved its offices to the very heart of the city, on Maharashtra Day. A new Governing Body was elected, with such distinguished

persons as Sri Shankarrao Ogale (Chairman) and Sarvasri Baliga, Rege, Mineeyar, Patke, Bhise, Phalke, Apte, Patankar, Kulkarni, Aslekar (General Secretary) and a number of intellectual and high government officers. A Technical Advisory Committee was appointed. A substantial amount of IPY work was done during the year. A course on Stores and Inventory Control was organised at Sakharwadi.

Farm Output

Special interest, however, is being taken in the development of Agriculture. Sri Jayantrao Bhosale, Managing Director of Krishna Sahakari Sakhar Karakhana, Rethre Budruk, District Satara, has prepared a scheme for increasing production in Agriculture. The Scheme was discussed by the Governing Body. It was felt that it should be sponsored by the Satara District Productivity Council. Sri B. V. Nimbkar, of Phalton, delivered a lecture on Indian Agriculture under the auspices of the Satara District Productivity Council.

A study trip to Kolhapur was organised in collaboration with the Kolhapur Productivity Council. About 20 members participated in this trip. The idea was to visit the various small and medium industrial units in Udyamnagar area in Kolhapur to know their methods of production, their problems, and how they solved them. The working of the Kolhapur Productivity Council, how they conduct their activities, their plans and proposals, and in what way they can guide and help the Satara District Productivity Council in formulating plans, particularly in respect of 'IPY-1966', was also studied.

The amount of Rs. 5,000 received as grant from the IPY Maharashtra Committee was allocated for the following:

- (a) Awards up to Rs. 1,000 for significant increases in output
- (b) Purchase of Technical Books up to Rs. 1,000 for the Council Library

Achievements of Patna PC

...The Patna Productivity Council was able to make a large number of people in all walks of life productivity conscious. About 15,000 persons visited the Productivity Corner at the exhibition held at Gandhi Maidan, Patna, which had posters, charts, cartoons and publications of NPC and PPC on productivity. An eight-page brochure in Hindi, "Story of Productivity" was distributed to about 3,500 persons, whose names and addresses were recorded for future contacts.

The elocution contest in English for University and College students on "Whether Productivity Creates Unemployment" attracted a large number of boys and girls.

We have also held a number of Seminars, important among them being on Good Housekeeping, and Preventive Maintenance. A seminar specially conducted for the officers of the Posts and Telegraph Department was very largely attended by the line and maintenance staff of the Telegraph and Telephone services. Seminars on "Absenteeism Reduction" and "Waste Reduction" were held in industrial units.

We have not been able to do anything in the field of Agricultural Productivity due to the drought conditions prevailing in this part of the country...

Since we cannot claim to have any spectacular achievement during the last 10 months, the National Conference is of the view that the activities begun in 1966 be continued for some time more, so that all the efforts of 1966 may not be wasted by closing down the programmes on the date the IPY officially ends...—KN KHANNA, Hony. Secretary, Patna Productivity Council.

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|--|---|
| (c) Conducting short courses on various subjects | (f) Seminar on 'Labour and Production' |
| (d) Film show on 'Productivity' | (g) Seminars on different subjects useful for small industrial units in their jurisdiction. |
| (e) Educational Tours | |

ACTIVITIES IN POONA

DURING India Productivity Year—1966, the Poona Divisional Productivity Council has organised a good number of special activities so as to spread productivity-consciousness among the wider sections of the public. Many of these activities were not confined to the area within the Council's jurisdiction, but were really meant for the whole of Maharashtra. Wherever possible the Council also assisted the other Local Productivity Councils in the State to organise similar activities in their jurisdiction.

IPY was inaugurated by the Poona Divisional Productivity Council on Jan. 5, 1966. Sri S. K. Wankhede, Minister for Finance, Government of Maharashtra, was the chief guest.

Training Programmes

The Council has so far organised 9 training courses under IPY Programme (see Table on page 682).

Seminars

The Council organised a Seminar on Value Analysis on July 2, 1966. Sri Khatau, President, Sri Mantri and Dr. Vakil, Founder Members of the National Association of Purchasing Executives, Bombay, conducted the discussions. 27 representatives from various organisations around Poona participated.

A seminar on Agricultural Productivity, organised at Baramati on August 21, 1966, discussed the following subjects:

- (i) Hybrid Crop Production—Its Possibilities and Difficulties;
- (ii) Irrigation Facilities and How Best to Utilise Them;
- (iii) Judicious Distribution of All Inputs in Agriculture; and
- (iv) Cultivators' Responsibilities in Increasing Productivity.

Dr. A. U. Shaikh, Secretary, Ministry of Agriculture and Cooperation, Government of Maharashtra, inaugurated the seminar, and Sri V. Ishwaran, Chairman, IPY State Committee for Agriculture, presided. About 500 progressive farmers from all over Maharashtra participated. The discussions were conducted in Marathi.

The Council organised a seminar on Productivity & Printing Industry on Nov. 6 and 7, 1966. Sri H. J. Talyarkhan, Minister for Small Savings, Housing, Fisheries, Printing Presses and Tourism, Government of Maharashtra, inaugurated the seminar. In all, 100 printers, publishers, artists from Poona, Bombay, Kolhapur, Alibag, Ahmednagar and Nagpur participated.

All the three seminars were successful.

The Council organised a seminar on "Role of Labour in Productivity" on Nov. 26 and 27, 1966, for the trade union leaders and personnel officers of industries in the Poona region.

Name of Training Programme	Name of Course Directors	Number of participants
1. Training Programme for Supervisors	Shri M. D. Apte Management Consultant	28
2. Stores & Inventory Control	Sri Q. S. Ahmed Asstt. Director N.P.C., Bombay	28
3. Data Processing	Experts from IBM World Trade Corpn., Bombay	21
4. Training Course for Supervisors	Sri M. D. Apte Management Consultant	20
5. Production Planning & Control	Sri A. A. Niazi Dy. Director. NPC, Bombay.	26
6. Union Job Relations	(1) Sri M. M. Mandalia (2) Sri S. B. Hegde Patil Staff Training Centre Ministry of Labour and Employment, Bombay.	10
7. Company Standardization	Dr. A. K. Gupta Director (Implementation) Indian Standards Institution; Mr. Hans Riebensahm UN Expert on Company Standardization with ISI	20
8. Office Management	(1) Sri H. J. Bakhr Director	22
9. Productivity in Banking	(2) Sri M. M. Mandalia Dy. Director Staff Training Centre, Bombay.	22
	Sri Anwer Divecha Management Consultant, Bombay.	17

One Circuit Team was organised and one more is planned. About 12 audio-visual programmes have been organised on different technical subjects, and a few more are being arranged.

Special Activities

Apart from these normal activities, a few special activities have been organised by the Council during IPY-1966:

With the help of local talent, a series

of 10 lectures in Marathi on different technical subjects, such as Productivity, Industrial Costing, Production Planning, Human Relations, and Work Study was arranged. Everyday about 80 supervisors, trade union leaders, and others participated.

On Aug. 12 and 13, 1966, a two-day programme on growing hybrid seeds was organised at Baramati, Poona District, by the Council. This was a lecture-cum-demonstration programme and about eight

farmers participated in this programme. It was very much appreciated, and the Council is organising this programme at Sangli and Ahmednagar.

Exhibition

An exhibition on Letterheads, Balance-Sheets and Home Journals was organised by the Council at Poona from June 22 to 26, 1966. From among the 100 letterheads and 400 balance sheets received, a carefully selected 125 letterheads and 80 balance-sheets were displayed. About 800 visitors saw the exhibition, which was greatly appreciated. A few monthlies in Marathi carried a special pictorial feature on this exhibition.

The Council informed all Local Productivity Councils in Maharashtra State that it would make available this exhibition material to them for arranging similar exhibitions at their places. Accordingly, the Kolhapur Productivity Council has taken this material, and is arranging the exhibition at Kolhapur.

A number of steps were taken to publicise IPY through radio broadcasts, etc.

Special Programmes

In planning a series of talks, and in selecting the subjects the Council helped AIR, Poona. It helped the respective speakers by giving the necessary background material to them, and by assisting them in preparing their scripts. In planning these series, the speakers from the Satara Productivity Council and the Kolhapur Productivity Council were included.

Apart from these talks, AIR Poona broadcast special programmes on the inauguration of IPY at Poona, an exhaustive newsreel on the Seminar on Agricultural Productivity organised by the Council at Baramati, and also a few other programmes.

The Council got special articles prepared on different aspects of Produc-

tivity—they were released to the Marathi Press all over Maharashtra as syndicated articles. There are about 100 Marathi journals, dailies, weeklies, monthlies etc., in the State, and these articles were sent to all of them. A number of them published the following articles:

- (a) India Productivity Year—1966 (by Sri R. D. Pusalkar, President of the Council) published in 17 papers.
- (b) Wealth From Waste (by Sri C. V. Joag, General Manager, The Bank of Maharashtra Ltd.) published in 13 Marathi papers.
- (c) Productivity & Self-reliance (by Sri B. R. Sabade, Secretary of the Council) published in 12 papers.
- (d) Productivity & Standard of Living (by Sri A. R. Bhat, Vice-President of NPC)—only recently circulated.

For the post-graduate students in colleges, the Council has planned an essay competition on the "Role of Productivity in Economic Growth." Four prizes—Rs. 250, Rs. 150, two prizes of Rs. 50 each—are being awarded.

The Council is organising a debating competition on "Does Productivity Create Unemployment," and three prizes are being awarded.

The Council has made an attempt to bring out literature on Productivity in Marathi. A translation of "Supervisory Training Charts", a US-AID publication, is being published in Marathi. The Council also proposes to bring out a Marathi version of "Business Is People".

Two special programmes for trade unions have been arranged during the year by the Council. Free admissions were given to trade union leaders.

A special programme on "Workers' Development" in Marathi is being developed by the Council so that respective factories may hold it for the benefit of their workers.

REPORT FROM SOUTH

A PART FROM formal inauguration, IPY made its debut in the Bangalore Region with a first-class Exhibition on Agricultural Productivity, organised by the Malnad Productivity Council, in the first week of January 1966. Over 6,000 persons visited the exhibition.

In February, the following programmes were organised: a seminar on Productivity & Economic Survival inaugurated by the Adviser to the Governor of Kerala, at Ernakulam; a Seminar on the Role of Trade Unions in Productivity, organised by the Mangalore Productivity Council; a 6-week course on Methods Improvement organised at Kottayam, by the Kerala Productivity Council; a seminar on Plurality of Trade Unions and its Effects on Industrial Relations, inaugurated by Governor Sri VV Giri, under the auspices of the Mysore State Productivity Council; and a Seminar on Industrial Development of Mysore District, organised by the Mysore District PC.

Import Substitution

In March 1966, the Chief Minister of Mysore State inaugurated the Mysore State Productivity Council Seminar on 'Management Preparing for 1967 and Planning for 1976.' In April 1966, the same Council organised a Programme on Import Substitution. In April, there were a number of other programmes: a radio talk by the Regional Director, along with Brig. Chakravarthi, on 'Is Indian Productivity Progressive?' The President of the Mysore State IPY Committee gave a radio talk on 'Productivity in Public and Private Sectors'. In the last week of April, the Rotary Club of Bangalore organised a Worker-hero competition. During May-June 1966, an intensive application course on Farm Management was organised

by the Kerala State Productivity Council at Palghat. The project work is continuing. Under the auspices of the Malnad Productivity Council, a conference on 'Productivity in Agriculture' was held at Hassan. The Mysore Chamber of Commerce, Bangalore, sponsored a two-day seminar on 'Agricultural Production'. Dr. VKRV Rao, Member, Planning Commission, inaugurated the seminar, and the Chief Minister of Mysore presided. Dr. PS Lokanathan delivered the valedictory address. A large number of technical papers were read. The Industrial Team Service, Bangalore, sponsored a 3-day seminar on 'Aspects of Top Management'.

In July 1966, the Indian Statistical Institute, Bangalore, organised a 2-week course on 'Reliability Engineering'. Sri TR Jayaraman, Vice-Chancellor of Bangalore University, inaugurated the course.

During August-September, IPY programmes were intensified: The Institute of Management, Bangalore, conducted a 3-day summer seminar on 'Orientation on Safety Management' at Bangalore. A course on MIM was organised under the joint auspices of the National Productivity Council, the Mysore State Productivity Council, and NITIE, at Bangalore. Mr. Steve Dembicki from Canada conducted it. Dr. K Nagappa Alva, Health Minister of Mysore State, inaugurated the Mangalore Productivity Council seminar on 'Productivity in Agriculture'. The Vice-Chairman of the Coffee Board inaugurated the Malnad Productivity Council Seminar on Plantation Industry—Export Promotion at Saklespur.

Quilon Seminar

Under the joint auspices of the Kerala State Productivity Council and the IPY

Kerala State Committee, a Seminar on 'Effective Fertilisation and Plant Protection' was organised at Quilon.

The Mysore State Productivity Council had a training programme on 'Labour Laws and Discipline in Industry' in Bangalore from Oct. 24 to 29, 1966. Dr. AV Raman Rao conducted the programme.

The Kerala State Productivity Council sponsored a seminar on 'Automation' on Nov. 5, 1966, at Ernakulam. About 100 persons participated. It was conducted by Local Talent.

The Kerala State Productivity Council has sponsored an appreciation course on 'Organisation and Methods' from Nov. 3, 1966, to Feb. 13, 1967, at Ernakulam. It is being conducted by Prof. NS Ramaswamy of the Bajaj Institute of Management Studies, Mr. K. Ramamurthy, Deputy Chief Advisor of Factories, Bombay, Mr SS Rangnekar of Union Carbide, Bombay, Mr SK Warriar, Indian Aluminium Co. Ltd., Alwaye, and other experts.

The Mysore State IPY Committee has launched a Technical Advisory Service Scheme to render assistance to about 200 Small and Medium Industries in the

Bangalore region. We have received a few requests for such assistance.

The Kerala State Productivity Council has on its cards the following Agricultural Programmes:

1. Application Programme in Paddy Cultivation
2. Effective Farm Management
3. Intensive Coconut Cultivation
4. Intensive Tapioca Cultivation
5. Scientific Soil Management

Seminar

1. Effective Fertilisation and Plant Protection
2. Agricultural Productivity

Plantation Industry Programmes

(a) Training Programmes

1. Supervisory Development
2. Productivity Orientation
3. Methods Improvement
4. Management Development

(b) Seminar

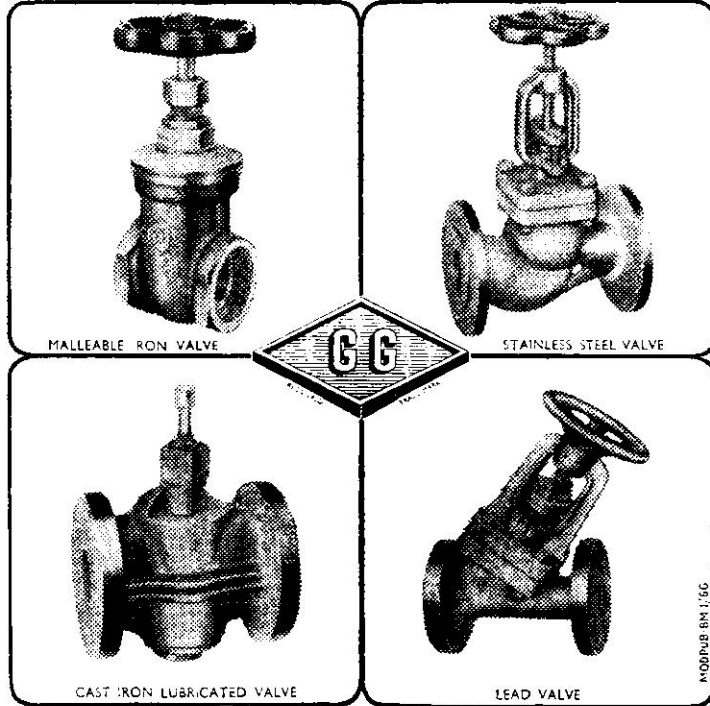
1. Productivity and Plantation Industry

Thus the Kerala Productivity Council may well be called an Industry-cum-Agriculture Productivity Council.

Every Day a Time of Testing

...It cannot be too often said that little things count. We, individuals as well as corporations, are judged by our behaviour, not in great crises, but in the minor adjustments of daily life. A corporation, like a person, starts every new day as a new time of testing. In the course of the day the corporation will be judged a thousand times, or ten thousand times, every judgment being based upon some feature it presents: its correspondence, its reception of callers and customers, its sales approaches, the courtesy of its clerks, truck drivers and elevator operators, the spirit of its executives. It is the personal experience of people with the company's workers and products that is of paramount importance in image-building...—*The Royal Bank of Canada Monthly Letter.*

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TO WASTE**

FOODS

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The housewife is already familiar with our dehydrated vegetables. Plans are afoot for offering her a greater range of such foods. The day will break brighter tomorrow...with a little less of care, a little more of joy.

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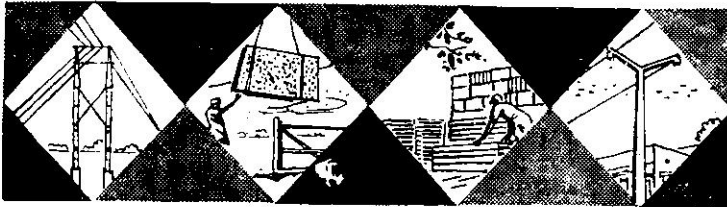
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WATCH YOUR COSTS

The two-colour feature **Watch Your Costs** was first published privately for the supervisors of the Tata Engineering & Locomotive Co. Ltd., Jamshedpur. The text, presented in the following pages, has been thoroughly revised, and represents part of the effort put in by TELCO towards India Productivity Year-1966.

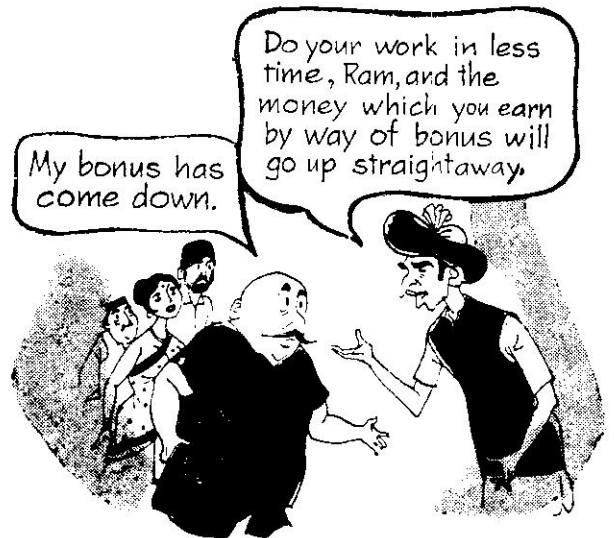
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WHAT ARE

Let us get it clear. Costs are not figures. Costs are manhours per truck, weight of steel per locomotive, oxygen per ton of castings, weight of sand per ton of castings, the tonnage of alloy steels of different types per excavator, the wages cost of a truck, the wages cost of a standard hour, the number of indirect men per unit produced, the oil consumption per ton of forgings, the tonnage of cement per unit of house built, the weight of ballast per mile of road built, the percentage of efficiency of labour, and so on. This is what costing really means; these are the matters you have to watch.

The figures brought out by the Accounts Office summarise the hundred and one transactions that go through the Shops: transactions similar to what we have just mentioned.

When the Accounts people bring out figures, at the end of the month, or at the end of the week, or at the end of the day, they are merely expressing your work in terms of a common factor—money. Don't get confused by accounting terms. Stick to the basic facts.



COSTS?

I can't sign this Requisition, Ram, you have asked for 3 cwts. of cement for that machine foundation job. Surely you can do it with 2 cwts.

I will try, Sir.

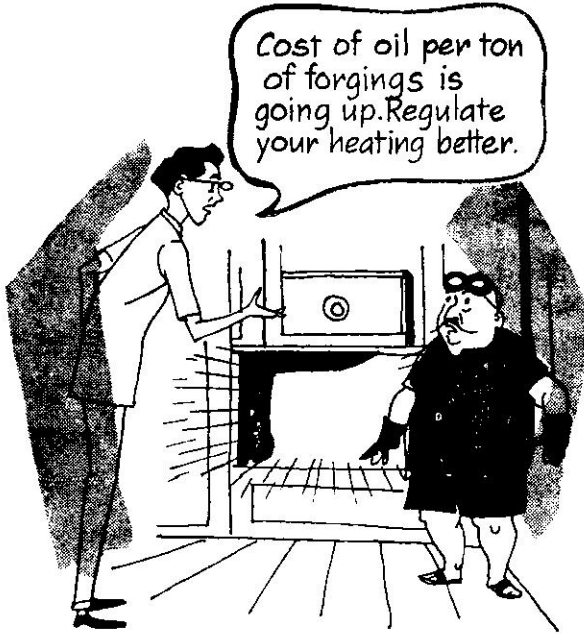


Krishnan is away having his tea. Each half-hour the machine tool is idle means that we lose Rs. 10/-



Accounts statements are too late anyhow. It is a report of expenditure after it has happened. What is important is to watch your expenditure **BEFORE** it is incurred.

Before you sign a material requisition, think a little. Is the quantity of material noted on the requisition really necessary? Cannot less be used?



Before you ask for more staff, think again. Can't you manage with the same number of men by simplifying procedures? It has been said time and time again, and with great truth, that there is no procedure anywhere which cannot be further simplified: in other words, which cannot be done with much less cost.

This is what cost consciousness means. Don't mix up cost consciousness with the Accounts Office. Cost consciousness depends entirely on YOU—what action YOU take to bring down cost BEFORE they are incurred.

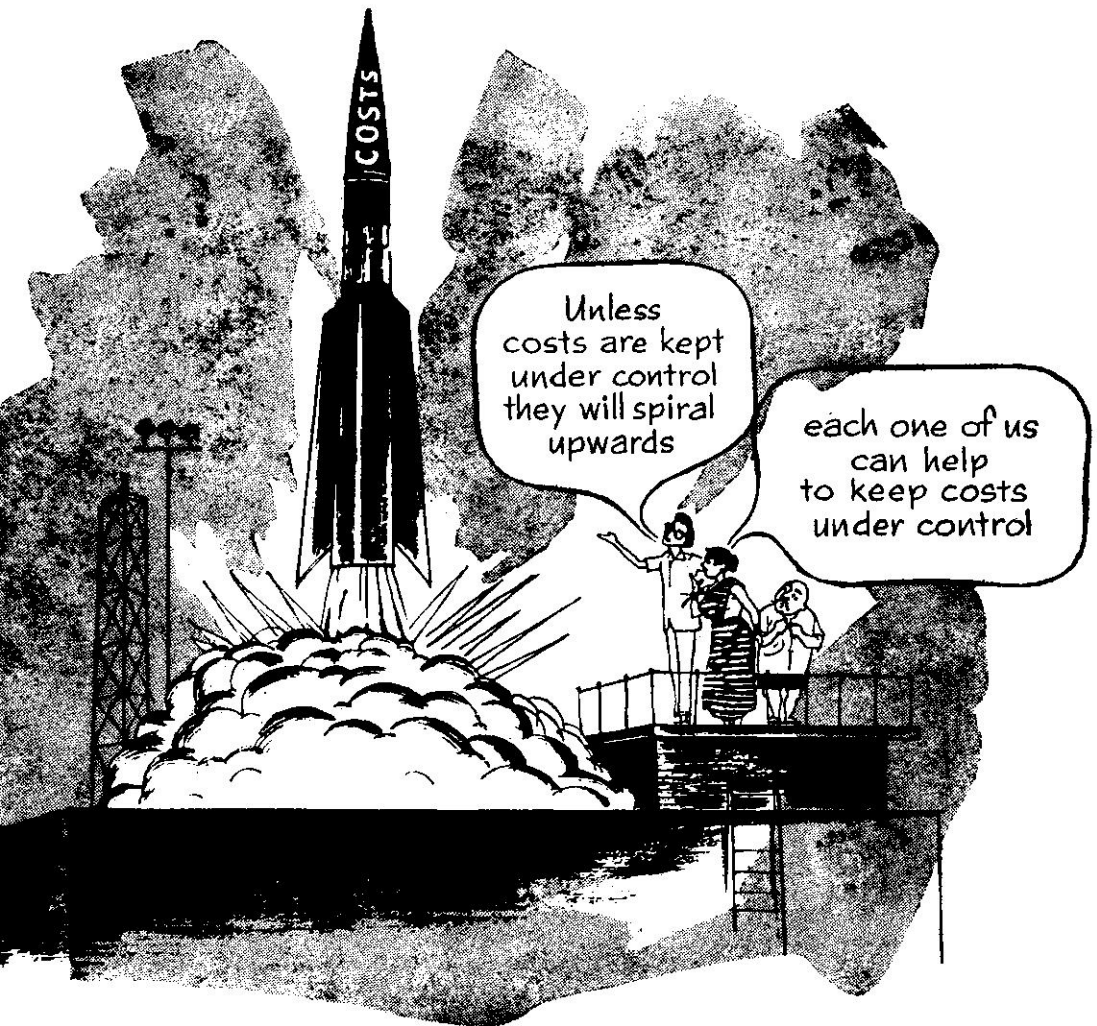
The Accounts statements can be used as a guide for the future. It summarises all your transactions. It can help you to plan future cost reduction but in the last analysis, it is YOU and YOU alone that can bring down costs.




COSTS

must be cut

Are we tending to become a little careless? After passing through many years of difficulties when on occasions we did not have sufficient money even to pay our bills, the pendulum appears to be swinging the other way. Some of us feel that as our products are now selling well, we can





Keep these items well under control

SCRAP and WASTE

**CARELESS USE OF
tools, equipment,
material**

**UNNECESSARY
DELAYS**

sit back and relax. This is a most dangerous philosophy. Now is the time to watch. Unless costs are watched the whole time, day in and day out, they have a habit of spiralling upwards. This has actually happened in many Companies as they were not watchful when they were good. Some of those Companies are now in great trouble with big overhead expenses round their necks.

We just cannot afford to fall into this trap. Whatever our job may be, each one of us can to reduce cost. Please don't imagine that cost consciousness is a thing which concerns only the Accounts Office. Not at all. Cost consciousness is a matter which all of us must do. We must do this whenever possible before the costs are actually incurred.

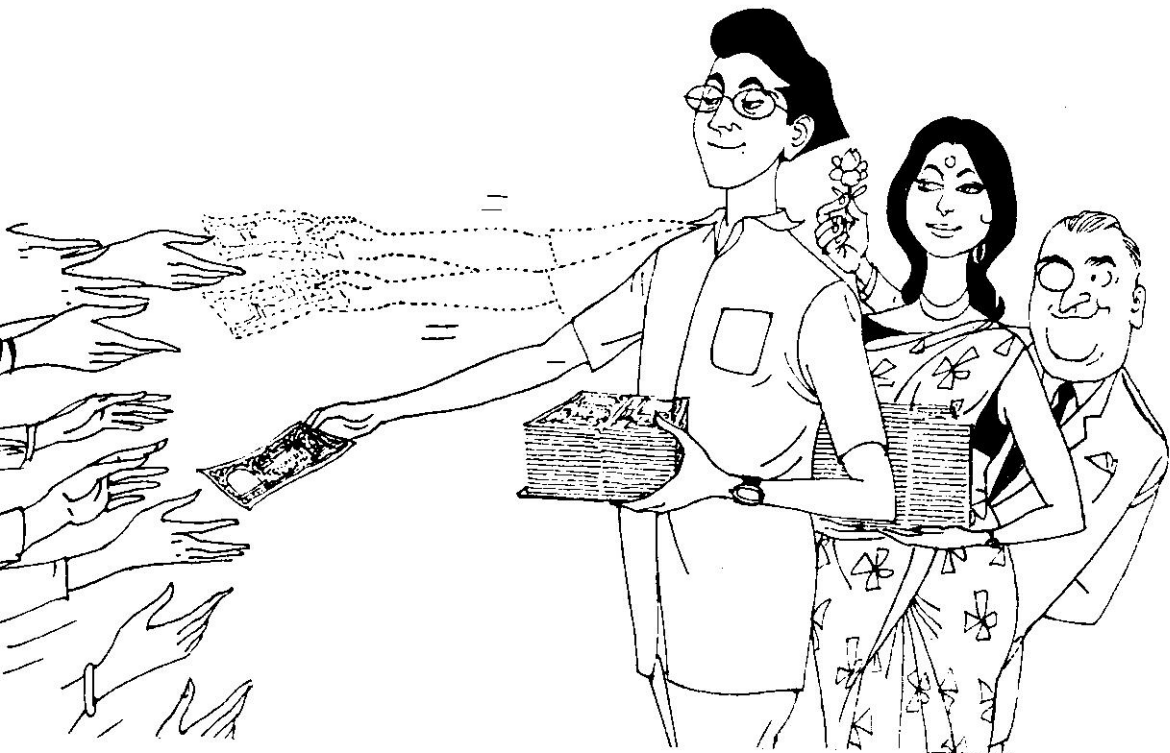
This does not mean that we should all start schemes to save many thousands of rupees. It is not possible for most of us. But what about the smaller savings—a few rupees here, and a few rupees there. It all adds up to large figures if we apply our minds to this problem. For example, a typist is capable of thinking out ideas for saving costly paper and effecting economies in the use of printed forms or office supplies. Recently a typist proposed a scheme for saving time in the use of letters by which there would be no marginal insets. A very simple idea, but it saved time. Time costs money. Lights left on when not required; machine tools kept running unnecessarily can run up a large electricity bill.

There are also other spheres where savings can be effected. How about some ideas for more intensive utilisation of plant and equipment. Factories abroad would certainly produce considerably more than what we do in India. Our investment and plant must be made to yield its maximum contribution. All this helps to bring down costs. Ideas for simplifying engineering designs including the elimination of frills and trimmings, would also help. Oil leaks, use of printed forms for scratch pads, wasting air from compressed air hoses can all result in sizable cost which can be avoided.

Do not keep a man waiting because arrangements were not made in advance or because of machine breakdowns or because tools were not available in time. Wages bill is one of our biggest items of expenditure. Idle time, waiting time, or time not properly utilised is one of our biggest items of waste.

Movement costs are always high. In Engineering firms up to 60 per cent of the cost of a product can be the cost of movement—from the storerooms to the shops, movement of a job from one machine to another, from one inspection point to another—it all adds up to a considerable amount. There are many possibilities for reducing costs by simplifying movement.

SAVE MONEY BY SPENDING MONEY ...



....this sounds funny, doesn't it, but how true it is. Take the example of bad roads and traffic jams. Has anyone ever tried to calculate the cost of additional fuel, the cost of additional maintenance to vehicles, the cost of nervous strain: all very real and all caused by bad roads and traffic jams. And all this adds up to very big money indeed. Money spent now on improving roads and making some traffic flyovers might even pay for itself entirely within 2 or 3 months.

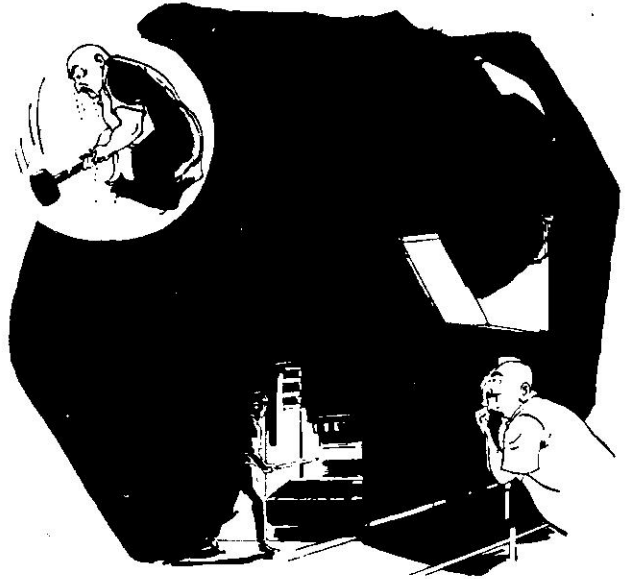


Money spent on expensive forging presses as against hammers might be a very big item of initial cost, but if you consider the increase in volume of production and the cost and quality of the final product, you will find that the big money spent initially gives a far cheaper final product in the long run.

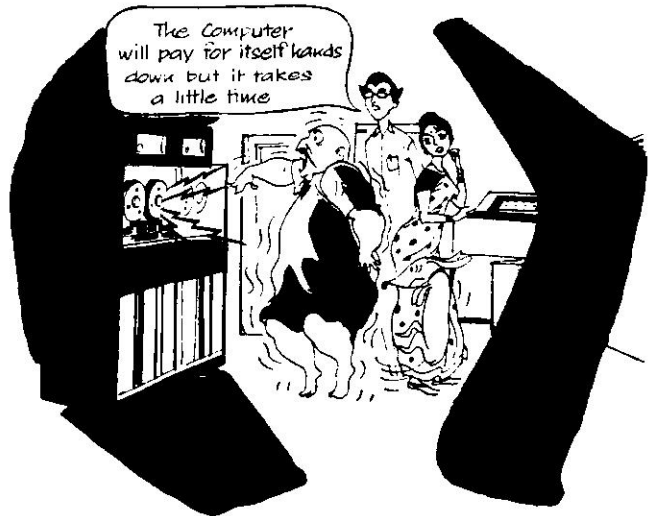


Cost consciousness does not mean cutting costs everywhere indiscriminately. Take the example of a Computer. It costs a lot of money. It might not pay for itself for even two years, but after that it will pay hands down by way of better service and better coordination and speed.

Why is expensive automation the biggest growing industry in the United States and Europe? Not because people like to have automation for the love of it, but because it means larger volume and lower costs. Everyone benefits—the country, the Company, and the employees themselves.



You will find that good conditions—clean, tidy and well laid-out workshops and offices—will always lead to better work. The extra expenditure on good house-keeping will pay for itself at a later date many times over.



There is always a strong temptation to buy something cheaper, but have you examined all aspects of the purchase? Will you have greater maintenance problems in the future? Will you have any serious loss of production due to breakdowns? Are you standardising? Will the lack of an essential spare lead to an expensive delay? It's not always the cheapest that is the most economical. Every aspect of the case must be considered.

PARKINSON'S LAW.

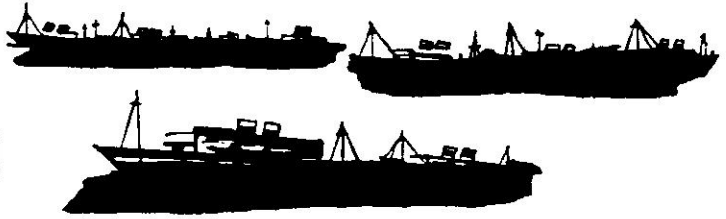
... or the more office workers you have the more work you create



Parkinson was a Professor at the University in Singapore. His law has made all persons connected with office routine sit up. It has made many of them feel uncomfortable because his Law is true. Clerical staff makes work. The more clerical staff you have, the more will that staff increase. It has a snow-balling effect. An increase of an officer means an increase of assistants, typists, etc. for him. This in its turn leads to more staff because there are more notes typed out. Extra letters are written. Letters have to be answered. Drafts have to be approved. Work is created. The

net result is increase in clerical staff and increase in paper work. Five men are doing the same job which only one man might have been doing before for years.

The mere fact of having men creates work: problems regarding their leave, their promotion, their sickness, giving them typists and stenographers, etc. Records have to be kept for all this staff—this in its turn creates work. Notes are made which are passed on to other people who comment on these notes and so it goes on. A person in a post, even if there is no real work, creates work.



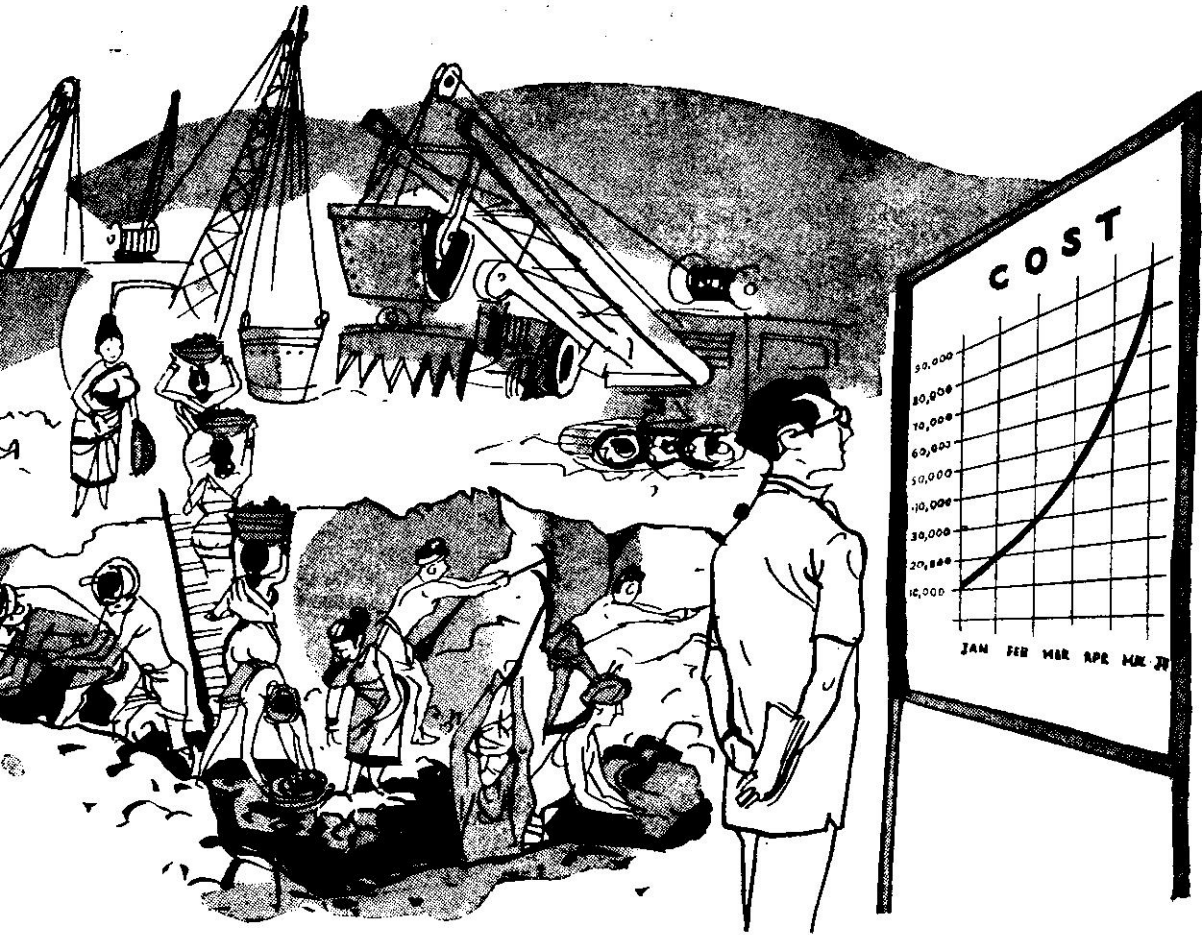
Unless there is the most careful check and a constant watch on the work of clerical staff, personnel begins to mount. Just look at the results:

Admiralty and Dockyard white collar staff have GONE UP by 55% and all this happened despite the fact that the ships in commission have GONE DOWN by 68%.

It is no exaggeration to say that every clerical operation can be simplified. Just look at the terrible example of the British Colonial Office and the British Admiralty. Staff mounted up simply because they took no trouble to watch and analyse the work of the staff.

Take heed of the statistics which we have given. It is a lesson for all of us. That's Parkinson's Law for you.





MOST PEOPLE CAN GET A JOB DONE...

°But at what cost? Having a hundred men and two excavators to dig a small hole is obviously most extravagant. Surely the important thing to remember is the cost at which a job has been done. If a job is done with only two men where four men previously did it, then this is something one can be proud of. Cost consciousness is one of the most important qualities of a good supervisor. Are YOU cost conscious?

THIS IS HOW THE MOST EFFICIENT FIRM IN THE U. K. DOES IT

Lord Marks, Head of possibly the most efficient firm in England, Marks & Spencers, made the following remarks at a recent meeting:

"We subject all our procedures to constant scrutiny in order to eliminate useless paper work, and the results that have again been distributed substantially to the benefit of our profits.

Some of the things done by Marks & Spencers, are positively amazing if seen from the wrong angle. The keeping of detailed records at each store, some of them with stock movements in and out has been swept away. That, in itself, was a tremendous decision, but experience has proved its worth.

These Assistants no longer come in and out which has been found to be not only good for the 'ego' but a great saving in cards, statistics, etc. at Head

Office. If a branch manager wants some simple requisition for his office that can be obtained locally, he buys locally instead of indenting on a central store. In sum total, it adds up to tremendous figures.

"We estimate that we have cut some twenty-six million pieces of paper, cards, forms, etc. previously handled—and the queries that are inseparable from 'paper work'. Internal Audit Staff has been cut by a third; other work has been found for them. The number of employees has been substantially reduced despite increased business done."

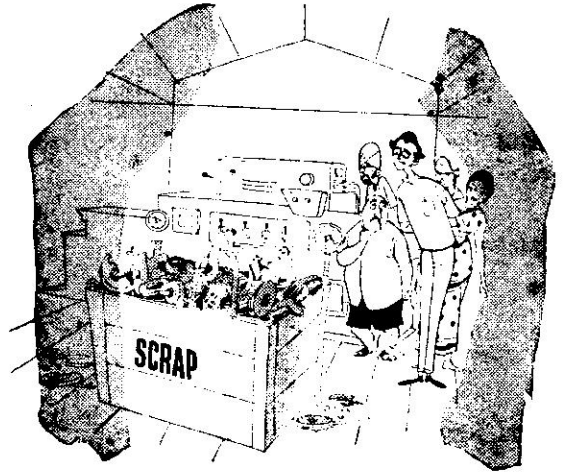
A point of particular interest in Lord Marks's speech for those who have efficiency at heart is the Company's Simplification Exhibition at its Head Office where some of the Marks & Spencers' simplification methods were illustrated.

This is probably the reason for the enormous and rapid success of this vast enterprise. They refuse to accept anything just because it was existing before. There are no set doctrines, no dogmas, they make a realistic appraisal for everything.

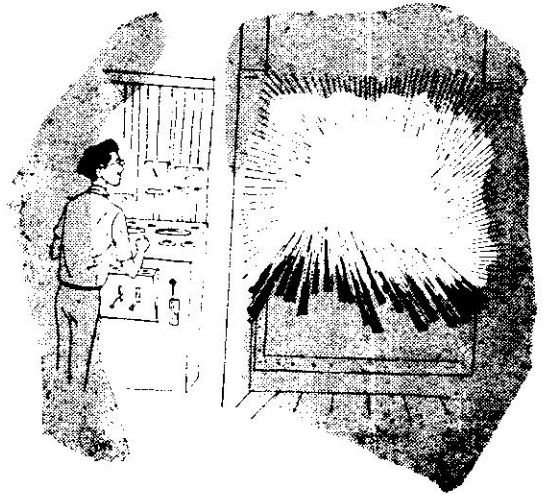
COST CONTROL

**WHAT IS THE SUPERVISOR'S RESPONSIBILITY ?
HE.....**

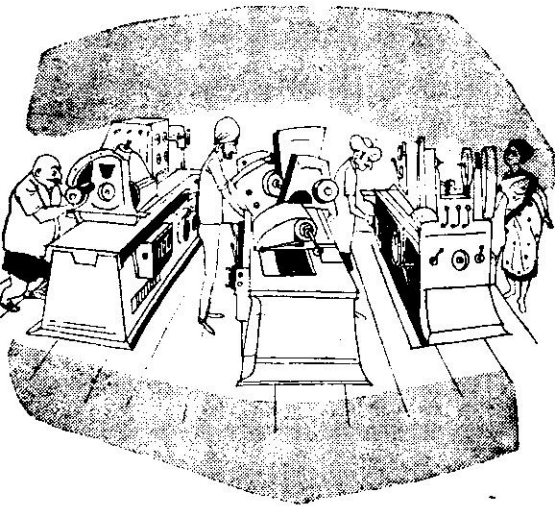
...watches his scrap carefully. He always makes out a report on his scrap so that recouplement action can be taken in time. He also examines the reasons for his scrap so as to reduce scrap in the future.



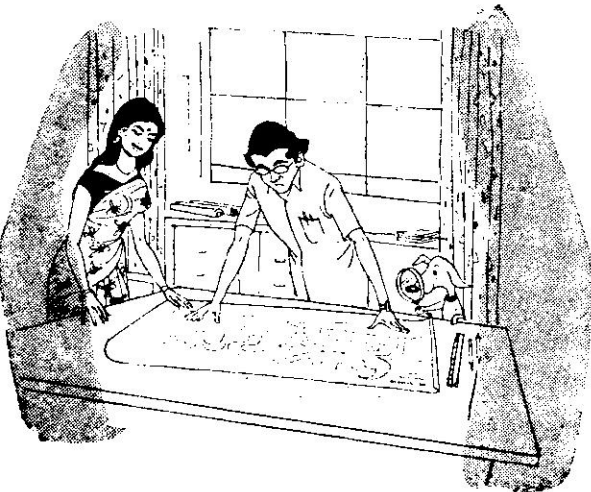
...ensures that the amount of furnace oil that goes to the furnace is properly regulated. We spend lakhs of rupees every year on furnace oil.



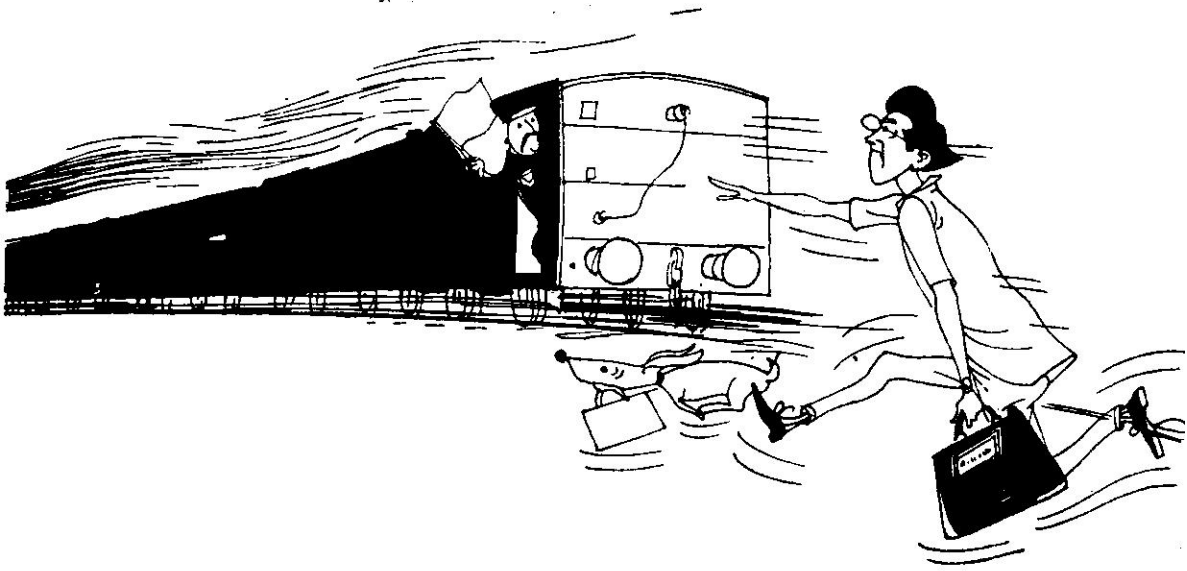
IOUSNESS



...ensures that our existing machine tools are fully utilised and only such number of machine tools as are actually required are ordered.

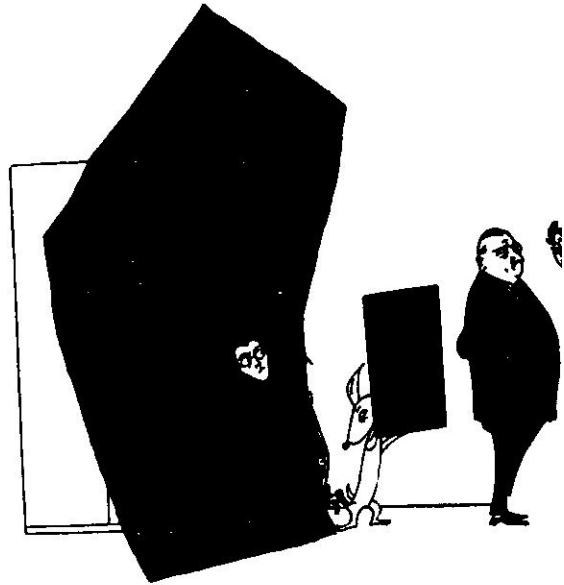


...is working out the most economical method of machining a component.



COST OF DELAY

Maybe our supervisor is hiding things but you will be surprised at the very large number of hidden costs which no one realises which you have in an average factory. Perhaps the biggest of these hidden costs is the cost of delay.

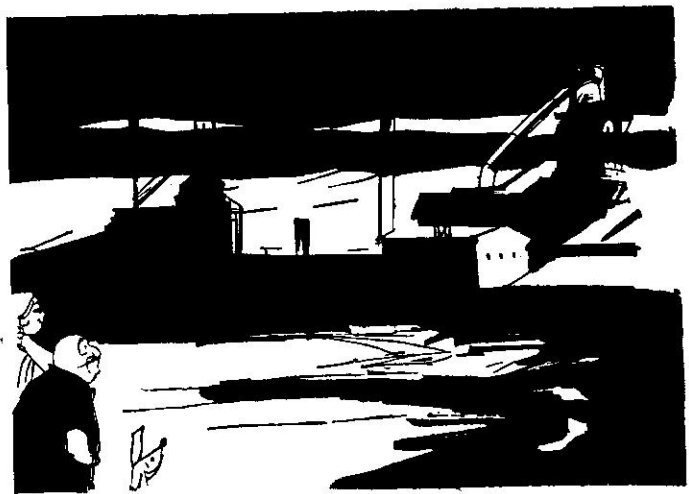


A delay of, say, a month in the completion of some equipment is a loss to the Company of its production. A delay a year in getting a factory means that a year's production is lost and this might add to very big figures. So, remember, when you next take time to decide on a purchase hoping to get a price reduction, take into account all the consequences. Are you quite certain that the delay in your deciding is not going to cost more than the final product will be delayed?



Just a year's delay in committing a million-ton Steel Plant means that 50 crores of worth of steel is lost. And what are the reasons for the delay? There may be the possibility of saving, say, a few lakhs by switching from one supplier and another, because someone cannot make up his mind or because papers have gone astray or because someone has deliberately wants to delay the project.

But look what it costs the Nation—well over Rs. 50 crores. This is not the real cost. Thousands of people who have got jobs are without work. A million tons of steel might have been consumed. Suppliers of ancillary materials are deprived of work, and so it goes on. The real cost to the Nation is enormous—and all because there was the possibility of saving a few lakhs and the person concerned just could not look beyond his nose to realise the real cost of his delay to the Nation.

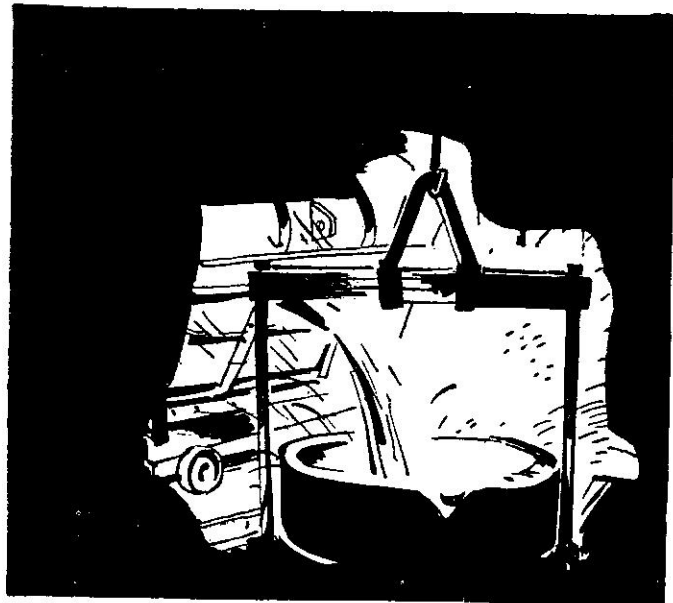


Just consider the enormous interest charges alone. This is just one of the very tangible and substantial items which represents the cost of delay.

Why delay? You will find that in 99 cases out of 100 a delay has not helped to arrive at a correct decision at all. It's only because someone refused to make up his mind in time. And when he did eventually make up his mind, say, after 3 months, it took him only 5 minutes to take a decision. So why delay in the first instance?

There is no perfect solution to any really important issue. No decision on an important matter settles everything and makes everyone happy. At best, it's a compromise. After weighing up all the alternatives choose the one that will do the most good, but for goodness sake don't delay.

Another important hidden cost is due to not making full use of the production facilities which may be available. It sometimes may be a wise policy to take on an order even though you might not make any profit. This may at least enable you to absorb a substantial proportion of your fixed overheads which would otherwise be a burden on your costs.



Summary of the Recommendations of the Indian Productivity Team on Cost Accounting, and Financial Control in the USA, UK, and West Germany

Abroad, Managers at all levels are thinking the whole time in terms of reducing manhours, keeping inventories low, avoiding scrap, increasing efficiencies, reducing waste and bringing down unit costs. In other words, Managers are very cost conscious. This is something which every supervisor in Telco must imitate to the advantage not only of himself, but also of the Company.

Managers and supervisors abroad are much more cost conscious than their counterparts in India because they have had considerable training in the understanding of accounting figures and the inferences that can be drawn from them. An atmosphere should be created by which both the work personnel and Accounts staff have a much better understanding of each other's problems so that the Works personnel make more effective use of the control information brought out for them by the Accounts people.

The Accounts Department should be treated more as a Service Department to assist Managers at all levels in the direction and control of day-to-day operations. The distrust and suspicion of this Department which prevails in many organisa-

tions in India should be removed.

Management should give serious consideration to the adoption of budgetary control techniques. This will enable them to decentralise authority and responsibility while retaining control. Even though it may not be possible to introduce full-scale budgetary control and standard cost systems, the techniques should at least be adopted partially.

Every organisation should have incorporated in its accounting systems the basic principle of setting up standards and targets and reporting actuals against plans.

Accounting reports should be so designed that they are simple and readily understood so that they are of real use to the different levels of Management.

There is great scope for simplification of records and cutting out duplication.

Systems and procedures should be so organised that there is a "built-in" system of check and double check. It is far better to have a good self-checking system rather than a poor system with an army of audit clerks who will discover mistakes made many months after the transaction has taken place.

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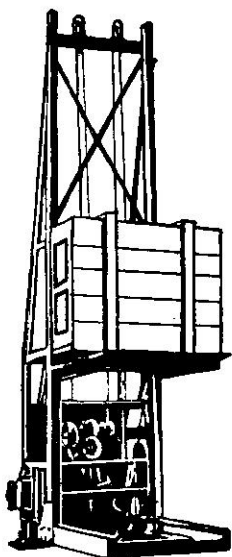
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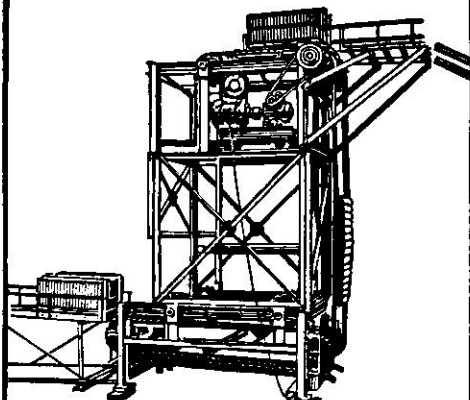
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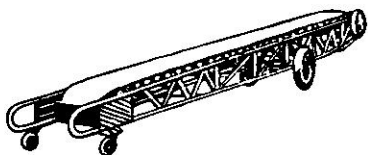
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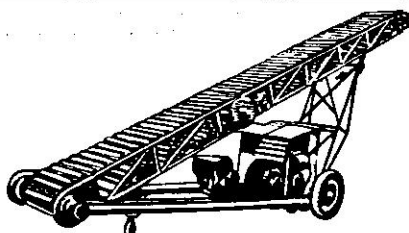
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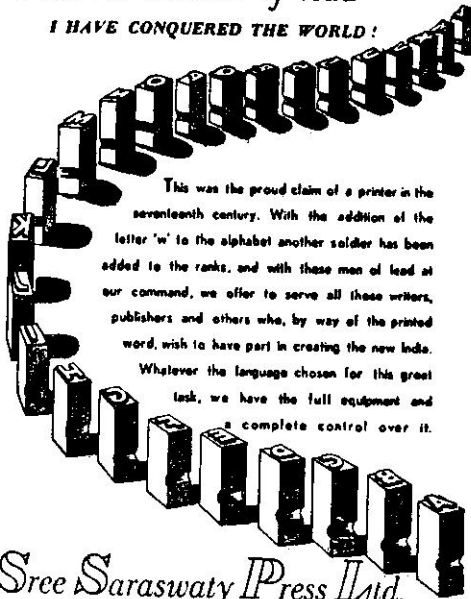
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