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INDIAN RELATIONS IN INDUSTRY WITH SPECIAL REFERENCE
TO THE MAINTENANCE/PRODUCTION RELATIONSHIP

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Organized in co-operation with the German Foundation for
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HUMAN RELATIONS IN INDUSTRY WITH SPECIAL REFERENCE
TO THE MAINTENANCE/PRODUCTION RELATIONS IN

The purpose of this paper is to draw attention to some factors which enter into the policy making which is the responsibility of those who are charged with steering the economic development of a country in the modern context. All such activities stem from the establishment of a long term plan which is designed to identify the natural resources which are available, to assess those which can be developed to the advantage of the population of the country in raising their living standards, and also to select those products which can be exported in exchange for other goods and services required to further improve the economic status of the country concerned.

The nature and scope of these activities is obviously conditioned by the characteristics of the resources available for example, the presence of oil in an area which might otherwise be lacking in other natural resources obviously leads to the development of an economy in which this natural resource is exploited and largely exported, and the resultant income is devoted to the purchase of materials and facilities which are not present in the country concerned. Other examples exist of areas in which the main feature is the extensive arable areas available when the building up of herds of sheep and cattle provide the opportunity of selling this product to other nations not so

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well endowed, and the application of the revenue to goods and services purchased from those nations who need the exported product.

In many cases the picture is a good deal more complicated; many nations have a wide field of natural resources and this leads to the establishment of a mixed economy which is very desirable because if the effect of weather e.g. drought, flood etc. results in a recession in that particular sector of the economy, the remaining industries 'cushion' the effect of such a set-back.

Whatever the circumstances are it is certain that in the consideration of an administrative system, there are certain formal procedures which cannot be neglected such as:-

- defining the broad scope of the long term economic development plan
- identifying the functions over which control is necessary if the plan is to be implemented on an organised basis
- selecting personnel of the required qualification to play a defined role in the administrative system
- laying down the acceptable standards of performance required if their work is to make the required contribution to the total strategy

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- giving such personnel the necessary authority to discharge their responsibility
- ensuring that effective lines of communication exist to ensure that the tactical decisions made by these administrators conform with the overall strategy and provide a flow of information as regards achievement.

These fundamental steps in the creation of a communication system and delegated authority are basic and cannot be omitted. The purpose is mainly to eliminate the very considerable waste of effort which would occur if these points were omitted. It is not sufficient for a number of extremely enthusiastic and willing people to do what seems to them to be helpful to the objectives of the entire population. It would not be long before the actions of one individual started to interfere with the equally well intended actions of another and the situation would soon develop where frustration and disappointment would dissipate the fundamental good will which existed at the beginning. A simple example is that of a football team. Each member of the team is motivated by the desire to win the game but this objective would not be achieved if they were all told that the purpose was for them all to invade the territory of the other team and score goals individually. It is well known that what wins football matches is the

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appointment of one of the players as the captain who allocates specific roles to each player on the field and as a result, a strategy is applied in which all people concerned play an important part but the actual scoring of goals is the result of co-operation between the whole team each working within a set pattern.

A further example is conducting a military operation. Campaigns would not be won if the entire military force marched towards the enemy all determined to totally occupy his territory. In practice, the high Commanding Officers devise a strategy which might involve the creation of one or two diversions, the launching of a concentrated local attack and the achievement of military objectives as a preface to the development of the strategy and the progressive winning of key areas, culminating in the achievement of the total objective.

The organization of the economic development of a country by the exploitation of its natural resources conforms to similar principles. The priorities necessary to achieve a measured progress at a pace which does not overstrain the human and industrial resources is essential if success is to be achieved.

Any human endeavour requires the participation and co-operation of human beings and even in the simplest situation it has always been necessary for the discipline

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of a leader to be accepted. Running a small farm for example - although the time for sowing and the time for reaping are well known to all members of the team, it is still necessary for priorities to be set and effort to be directed to particular tasks if full advantage is to be taken of the seasons, weather etc. This is so even if the leader and workers on the farm consist of father and sons; the necessity for being more formal about the allocation of duties and setting the framework within which the overall leader wishes his team to function, becomes crucial when the individuals filling these various roles have no natural loyalty such as exists between father and son and where the tasks which they are required to carry out are such that often considerable professional training is necessary before they can be undertaken successfully.

When the task is the operation of a small industry let alone groups of industries and national enterprises, the need for some formality in the setting of authorities and responsibilities becomes crucial; effective communication to receptive individuals is a key requirement, and this can only work smoothly if the morale and sense of purpose of all concerned is sustained by effective lines of communication. It might be said that under such circumstances an imposition of a rigid discipline with a system of penalties for those

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who break the rules would compensate for low morale but this is no real substitute for the preservation of harmonious relationships and a willingness to co-operate.

The point is being made that if the organisation of industrial activities is accepted as a guide, the one single factor which can make all the difference between an inefficient organisation and one which is dynamic and successful, is the state of morale of each individual in the organisation, and this can only be promoted and sustained by the wise use of authority and the transmission of information to the lowest level. This does not of course mean that every semi-skilled worker in the organisation must have full technical and financial details; using the line of delegation in the organisation it is part of the role of each person with authority to transmit to those under his immediate control, sufficient information regarding the work which that individual does to ensure that he does not lose his sense of purpose and that when he is given instructions from his superior those are meaningful to him in the achievement of his own objectives.

Some time has been spent on the foregoing because of its key importance at all stages of an industrial situation. The necessity for harmonious relations between the Supervisors and Administrators of every aspect of the

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organisation is equally important and this is undoubtedly true of the relationship between those responsible for production and those responsible for the maintaining of the production facilities. 'Production' and 'Maintenance' require free interpretation; an essential part of an industrial enterprise might well be the transportation of the raw or semi-processed materials from their point of occurrence to process industries prior to distribution internally or for export. This would, in most cases, involve the provision of road or rail facilities and this in turn means that if these facilities are to be effective then they must be maintained in a condition which enables them to be used economically and not allowed to deteriorate. The efficiency of the enterprise would soon be diminished if transportation of the resources became erratic or interrupted because of breakdown or natural deterioration and as in any other part of the organisation, if the maintenance responsibility is not effectively discharged, the work of the entire operation would be disrupted.

Applying the general principles recited above it is obvious that the maintenance function must be the responsibility of an individual suitably qualified and with the necessary facilities and authority to use these in order to fulfil his objectives of keeping the facilities concerned in good running order. If, however, his efforts are to make the maximum contribution to the success of the

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total enterprise it is obvious that co-operation will be necessary between himself and the users of the facility. It would not be right for example, if he was to decide to withdraw the road or rail transport referred to in the previous example, or close a section of road for repairs without consulting with the users as to the affect this might have on his objectives. Equally, it would be unreasonable for the user of the facility to demand of the person responsible for maintenance, a large programme of work which would completely absorb his capacity and make it impossible for him to give a maintenance service to other branches of the industry. Intelligent co-operation between these two parties is essential if as members of the total team, they are to make their respective contributions to the success of the industry as effective as possible. Both could claim from their terms of reference that the action they wished to take was "right" but such a narrow view on their part would mitigate against the success of the overall plan and it is essential that they learn to 'live together' and take decisions which on occasions may represent a course of action which is not ideal from their own point of view.

Higher management in most Companies spends a great deal of time in selecting personnel and training them to ensure that this essential element of co-operation will

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exist between them because they recognise that if their Company is not to be made a 'battle ground' between individuals who refuse to co-operate, they must take steps to correct this situation even to the extent of removing the recalcitrant parties. All such individuals are of course human beings and are likely to have their personal enthusiasms and antagonisms, but if they allow these to interfere with their duty to the organisation, they will be running counter to the terms of reference which they were given from the outset i.e. that they are expected to carry out their function within the framework of the total organisation. Higher management cannot allow such a situation to continue because if there is bad feeling between two Administrators then one can be sure that the same troubles will develop amongst the subordinates of each and one may have a substantial part of the organisation and labour force in a state of non-co-operation.

No apology is made for dwelling so long on what are elementary aspects of human relations; it is a fact that the history of the failure of Companies and often countries, contains elements of the following defects:-

- No long term plan has been developed for the programme of development to be undertaken and the Administrators for the organisation have relied on making ad hoc decisions almost from day to day.

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Such a situation will result in people lower in the organisation being unable to get decisions as to the action they should take and very soon chaos will prevail apart from the fact that the morale of these people and those responsible to them will decline very rapidly. Having a long term plan does not mean however, that there must be obstinate adherence to the first plan made; the plan must be so constructed that it is flexible and can be modified to meet current circumstances without abandoning the overall purpose. It follows of course, that when such deviations from plan are made the changes must be communicated down the organisation so that variations in the tactical can be consonant with the strategic objective.

- These who have the authority to make decisions are are not equipped with the necessary knowledge to discharge their responsibility effectively.

It is all too easy when doing the strategic planning to consider organisation charts and a hierarchy of delegated authority on paper itself represents an effective organisation, but if the various functions are not filled by personnel who,

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by training and qualifications are able to recognise the problems within their responsibility and take the right decisions to meet them, then again the organisation will falter and eventually fail. This failure will be accelerated when the subordinates of such people recognise that their leader is not able to make good decisions and again, a slump in morale takes place.

- Members of the organisation have the necessary qualification but they do not understand their role.

This factor too, can diminish very greatly the strength of the total organisation; here we have a situation where the people concerned could make the right decisions but because their terms of reference have not been properly stated and understood by them they fail to respond to the demands of the situation. This can very easily be discerned by lower people in the organisation and yet again fatal decline in morale takes place.

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- All the above requirements are filled but the human relationship between the individuals is weak.

This situation can be likened to a well designed, well constructed machine where all the parts fit and where the machine can turn out good work but it will very soon break down if there is no lubrication between the moving parts.

Good human relations are the lubricants of industrial organisations which will not run smoothly unless this vital element is present.

This paper envisages the existence of fully or partially utilised industries and seeks to draw attention to an extremely important element in the relationship between the production function and the maintenance interest.

It is the main task of Management to ensure that all the personnel in the total organisation carry out their work in such a way that it contributes effectively to the achievement of the objective of the enterprise i.e. to sell their goods or services at a profit. It is not sufficient for all the personnel to be motivated by enthusiasm and good will towards the company. Such feelings are, of course most desirable, but unless every person has received a clear direction as to what his contribution should be if his efforts are to be fully effective, there will be a great deal of misdirected effort producing a poor result - and what is equally serious, the feeling of frustration and disappointment on the part of employees who have worked hard but to no avail. In any team game, it is essential that the members accept the discipline of the side, and carry out their designated role; they will always be more successful than a side which is extremely enthusiastic and energetic but who have no strategic plan of action.

Continuing this analogy, the most successful team organisation is one where a strategy applicable to the team play has been established, but the plan is sufficiently flexible to allow individual members to make tactical decisions on their own account in order that prompt advantage may be taken of local opportunities. The degree to which he can depart from his established role is defined so that the total strategy is not weakened. Such an arrangement is desirable and often essential because the leader of the team is not able to make all the decisions all the time; he is too remote and the adoption of such a rigid control would result in many lost opportunities.

In the same way therefore it is necessary in an industrial situation for Management to delegate some of his authority to the leaders of the various members of the factory team, indicating clearly the areas of activity which he wishes them to cover, and giving them the necessary degree of authority to discharge the responsibility. We will be considering in some detail the authorities and responsibilities of the production department and the maintenance department in a factory in order to illustrate the principles applying to their respective functions, and the relationship which should exist between them and how potential problems can be anticipated.

The starting point is to define the basic responsibilities of each i.e. the role which Management wishes them to fulfil in the managerial team.

The following definition has been found to apply to a very wide range of industrial situations -

PRODUCTION RESPONSIBILITY

BY THE DIRECTION OF LABOUR, MATERIALS AND FACILITIES, TO PRODUCE GOODS OR SERVICES TO QUALITY, QUANTITY AND COST STANDARDS FOR SALE AT A PROFIT.

This gives the manager of the production department a very clear directive as to what is expected of him. He is required to concentrate his efforts on the organisation of production. He establishes sources of supply of raw materials; he decides upon the methods to be used, the skills required, the number of personnel required and the space and equipment which will be needed to produce the volume demanded by the production targets set by management. He must ensure that the necessary quality standards are maintained, and the cost of these stages, the movement and storage of raw materials and finished goods, the power, lighting, heating, rental of premises and a number of other overhead expenses must be controlled

to a level such that, with the cost of materials included, the total cost of the product enables it to be sold with the necessary profit margin.

This is an extremely demanding job, calling for considerable managerial and administrative ability. It is not just a matter of designing layouts of production systems, although this is important enough; it also involves dealing with the day to day decisions which must be made in order to cope with the variations which will occur in spite of forward planning. For example, delays may take place in the delivery of raw materials, or they may vary from the specified quality standards, necessitating rejection or adjustment of the standard production methods. Shortages of labour may occur due to sickness or other causes, plant and equipment may break down or technical defects may be revealed by quality checks which must be traced and rectified. The additional cost of these difficulties may endanger the achievement of the unit cost laid down, and late deliveries may threaten the goodwill of customers.

Endeavouring to anticipate such problems and taking prompt and effective action to minimise the effect of such departures from plan when they do occur is what production management is all about.

To discharge the responsibility effectively, the Manager must know every facet of the raw materials, the process and the finished product, and ensure that his subordinates are all equipped with the knowledge necessary to carry out their roles efficiently. Let there be no doubt that the control of production is an extremely expert job and should command respect.

The production manager does not face his task alone; as has been described, he is provided with the services of a number of supporting functions. If his supplies of raw materials becomes erratic or not to standard he does not have to spend time investigating; he asks the purchasing function to deal with the matter for him. Labour shortage is dealt with by the Personnel department; technical investigations can be undertaken by experts. Indeed, he does not wait until a crisis occurs - he expects such services continually to anticipate potential difficulties and smooth them out before they affect his production operations, and the managers of these supporting services themselves have directives from Management which define their role of support to production.

We are concerned most with the Maintenance function, the importance of which is growing in many industries as they invest in plant and

equipment and become dependant to an increasing degree upon its availability for productive use. The sequence of stages of production, from raw materials to finished product, is a chain and when links in that chain consist of machines, if only one of the machines is not available for use, the whole line stops until it is restored to service and there is seldom any alternative available to keep the process flowing. Therefore the maintenance responsibility can be clearly defined as follows -

MAINTENANCE RESPONSIBILITY

TO ENSURE THAT, AT MINIMUM COST, PRODUCTION PLANT AND EQUIPMENT IS AVAILABLE FOR PRODUCTIVE USE FOR THE SCHEDULED HOURS, OPERATING TO AGREED STANDARDS AND AT MINIMUM WASTE.

This states quite clearly the nature of the service which the production manager can expect from the maintenance manager; he is required to recruit and train the necessary number of maintenance personnel and equip himself with the appropriate tools and equipment to service the production machines in such a way that production is not delayed because machines are not available.

This entails the carrying out of programmes of preventive inspections designed to anticipate any involuntary stoppages due to neglect of such things as lubrication or adjustment, carrying out planned overhauls and repair of normal wear and tear, and, in the event of a breakdown, restoring the machine to service with minimum delay. When the quality of the work done by the machine is dependant upon the mechanical condition the standards laid down by the production department must be maintained. Where malfunctioning of the machine causes product waste, this must be held to a minimum.

Hence the maintenance manager has complete freedom of action to operate his establishment as he thinks best to achieve the objectives laid down, provided that he does so at minimum cost. "Minimum Cost" means that cost which is acceptable to the production manager served; in establishing this, a decision needs to be made as to the machine availability which will enable the production manager to achieve his targets. If he was to demand a very high performance of his machines with virtually no breakdowns and no time available to carry out planned maintenance work, the cost of maintenance would be very high. It might be

necessary to have a large and highly trained maintenance staff standing by to carry out "crash" programmes of work and probably to have a large stock of spare parts to use for replacements, thus avoiding the delay caused by repair. Such a cost would probably inflate the production cost so much that he could not sustain his case and, in practice he would wish to organise his production on the basis that machines would be available to the extent of say 85% and enjoy the lower cost at which such a service could be provided.

This really brings us to the kernel of the relationship between the production function and the maintenance function. However much we define authorities and responsibilities and design systems and organisation charts, we must recognise that, in the last analysis, the success of the entire operation will depend on the inter-action of human beings who cannot be standardised.

The acceptance of the definitions offered ensures that the boundaries of authority of each party are clearly established. Obviously, it would be wrong for, say, the production manager to tell a mechanic how to do his job; equally it would be out of order for a member of the maintenance department to interfere with the production process.

Each have their "rights" and may complain if either invades the "territory" of the other. Each are experts in their particular speciality and should have mutual respect for the other. They are also human beings and we have all the makings of a situation in which the contribution of two expert people and their staffs to the objectives of the corporate body could be greatly diminished because their personal relationship is productive of friction. We must recognise that legally defined relationships are not enough - there must exist within the formal framework the willingness to cooperate and display tolerance based on mutual respect. The factory must not be a battle ground in which two functions engage in civil war, in which the company is the loser. The loyalty of each party is to the Company Manager and it is essential that they live together in harmony.

To be more positive, the following guide lines apply -

- the two managers should have respect for the expert knowledge which each possesses.
- each manager should be willing to reveal to the other details of his expert knowledge i.e. they should

not be secretive or protective about how they do their job.

- they should meet frequently and review their individual problems, treating them as problems shared between them and seeking the best joint solution.

- each should feel free to make suggestions as to how work is done. The maintenance manager should be able, without giving offence, to suggest a change in the production method. The production manager should be able to question a feature of maintenance procedure. It is only necessary to bear in mind that in doing so, the suggestor is stepping over the boundary of his responsibility and must be prepared for his suggestion to be politely rejected for reasons stated, and to accept this in good part.

Another reason for the necessity for good relations to exist between the maintenance manager and the production manager is that the same attitudes will be reproduced at the lower levels in their respective organisations and it would not in practice

be a matter of bad relations between these two individuals but production foremen would tend to be antagonistic to maintenance foremen and production operators towards maintenance men. Nothing erodes morale and efficiency more than friction between these two groups of employees. Factory managers pay particular regard to the personal characteristics of managers, appointed to these two important functions and evidence of their willingness to cooperate and act jointly, within their respective roles, to solve their problems enters into his assessment of their individual performance.

Promoting this atmosphere of friendly cooperation does not mean that both should say "Yes" to everything the other requests. It would be wrong, for example, for the maintenance manager, in an attempt to be helpful to the production manager in a difficulty, to take risks in his work which might result in damage to equipment or injury to employees. The production manager must not debase the quality of the product just to assist the maintenance manager in an engineering problem. Their first loyalty is to the company, but there is ample room for this to be honored and still adopt a jointly agreed course of action which satisfies the problem.

Some space has been given to this aspect of the maintenance and production relationship because this is the essence of the matter - in the last analysis, organisations and systems are operated by people. The ideal relationship between them will not come about "naturally"; there must be conscious effort to adjust attitudes and control temperaments and to build up the spirit of partnership and teamwork which distinguishes the well managed organisation.

As was mentioned earlier, the factory situation was chosen as being an environment in which the production/maintenance relationship could best be illustrated, but exactly the same principles apply to other activities where a maintenance service is involved - indeed, if the functions are more remote from each other e.g. the base maintenance workshop servicing a fleet of trucks or public transport vehicles, the need for sympathetic understanding of the problems of each party and willingness to cooperate is even more important to the success of the enterprise.

This portion of the paper assumes that the strategic balance of the national administration has been established and that development of the country's resources is about to take place.

In such a paper as this it is necessary to speak in general terms and not for a specific situation because undoubtedly factors will vary very considerably between one example and another. It is fairly certain however, that a preliminary survey by experts would establish all or some of the following factors:-

- the location of the existing or potential resources of the country will be recognised; by this is meant that according to the natural geography of the area it will be apparent for example that certain mineral resources exist which, when developed, can serve the needs of the country itself and enable excess production to be exported. A feature of another area might well be its suitability for the production of fruit or crops. Yet another factor might be the existence of grazing resources which would favour the rearing of herds of cattle. Many other examples could be cited which might also include subsidiary advantages e.g. the production of cattle not only

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provides meat for human consumption but also also supports a number of other useful by-products of such an industry.

- **Out of such a study is bound to emerge the fact that for the resources to be made available to the population and also to export them, their transportation becomes necessary. Such facilities may be necessary for the moving of the particular product in its existing form e.g. fruit, vegetables etc. to distribution points or before it can be utilised it requires some processing e.g. fruit juice, meat canning, smelting of ores etc. Again, the studies carried out will no doubt determine the best location for any part or full processing for example, if the final product required is fruit juice it might well be more economic to produce this close to the source of supply and to transport the finished juice than to ship perishable fruit to a distant processing point.**

It is suggested that what emerges from the foregoing is that for one reason or another the industrial life of the country concerned will depend to a considerable extent on the adequacy of its communications in other directions i.e. the moving of resources from their point of origin and the intake of materials necessary for the

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exploitation of the resources.

An example of the foregoing might be the need for the shipping of machinery to an agricultural area and the transportation out of the area of the resultant product. If the foregoing is accepted then it becomes apparent that road and/or rail facilities are required. This is not just a matter of civil engineering and laying roads and rail tracks and providing fleets of lorries, locomotives etc. This will not be effective unless the maintenance organisation exists which is designed to ensure that these assets do not deteriorate as a result of wear and tear and that they are kept in a condition which will enable economic and reliable transportation to be provided. It would be an expert's job to determine the nature and location of the maintenance facilities and this is the subject of another paper.

The utilisation of a number of resources particularly minerals, oil etc. in itself requires the extensive use of modern machinery; this too must be maintained in a condition which is going to ensure its availability on the scale of production required and one envisages Maintenance Workshops and facilities located close to such areas in which the equipment and skills exist for maintenance work to be carried out promptly.

Yet another maintenance requirement is promoted by the existence - as no doubt would be the case - of processing factories for the conversion of the natural product to a saleable form or for the preservation of the natural product for future use for export. This means that

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Further maintenance facilities no doubt located within the factories concerned will be necessary to ensure that the volume of throughput of this enterprise is maintained at the necessary level for economic operation.

Mention has been made so far of the basic industries likely to exist in a particular country; such industries produce the raw materials for yet other industries - for example, timber which is cut rough finished is transported to other factories which produce the grades and size of timber required by certain industries e.g. building, furniture manufacturing etc. Maintenance is still an essential element in the economic operation of any manufacturing enterprise and one would expect to find suitable maintenance workshops established within such industries.

It will be seen from the foregoing that the exploitation of the natural resources of a country on a meaningful scale will involve the massive use of machinery of all kinds. Machines are extremely good servants provided they are wisely chosen for the work required, used considerably and are given the necessary protective and running maintenance to ensure that the results of normal wear and tear do not unduly affect the quality of the work done or the availability of the machines for production use. It is very important to remember that in modern production operations where machines are used extensively, the conduct of the maintenance function may have a decisive effect on the profitability of the entire enterprise.

Once a factory is committed to a production schedule, this implies that its machinery will be available for productive use, operating to the established standards of quality and reliability. If this is not achieved then the effect upon output will be just as serious as the non-availability of production labour or a shortage of raw materials. It is also obvious that even if the foregoing requirements are met in factories or processing plants this will be to no avail if by a breakdown in transport facilities, the raw or semi-processed material does not flow freely to these points. Going back a further stage, none of the foregoing advantages will be operative if as a result of the breakdown of machinery used to gain the raw production in the first place, the necessary quota of the basic product is not available.

The main theme of this paper is the importance of the relationship between the maintenance function and those responsible for the production, transportation and processing of resources. It has already been made plain that the maintenance function is a service to production in the sense that it provides expert attention to the "tools" used in the processes of production, ensuring that these are in good condition and capable of carrying out the work for which they are designed. Hence it is very important that a partnership exists between these two elements - production has the responsibility to use its tools for the purpose of producing a tangible output which can be sold at a profit, and maintenance have the task of ensuring that this work is not frustrated due to the fact that their tools are not operational.

It might be said therefore, that if these two factors are made quite clear to the Administrators in charge, that the situation has been taken care of satisfactorily. What must be recognised however, is that all these functions are peopled by human beings and an additional element must exist if the total activity is to proceed smoothly, and that is a willingness for mutual co-operation.

Appendix 1

Appendix 2

THE MAINTENANCE/PRODUCTION RELATIONSHIP

DEFINITIONS

The organisation of maintenance work and the working relationship between the maintenance function, which is essentially a service activity, and the production function which is the prime profit-making activity of the enterprise is fundamentally that of the specialist and the customer and conforms to the same general rules of procedure.

The owner of a house, if he wishes to preserve his property or has need of a repair to his plumbing system, approaches - if he is wise - a recognised expert in these fields i.e. he seeks the advice of a qualified builder or a plumber. (In order to reduce his expenditure, he might decide to attempt the repair himself, thereby limiting the cost to that of the materials. The wisdom of such a decision is doubtful; by doing so, he foregoes the advice of the expert who has specialised in such work. Although the work which is necessary may appear to be very simple, in fact this may be a symptom of a more serious and extensive defect; like the qualified doctor, the building or the plumbing expert can interpret his diagnosis and identify the basic cause of the trouble from

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the superficial symptoms, neglect of which may intensify the overall result.)

Hence, employment of the qualified expert brings not only a recommendation as to the action to be taken, but also - if his advice is accepted - the services of experienced craftsmen for whose work the expert takes responsibility. He also considers it part of his duty to confer with other experts if he feels this is necessary to ensure that his client is given the best possible service; therefore if some exceptional condition exists e.g. fungus attack or soil subsidence, he might himself call in a specialist consultant in these subjects to ensure that the action which he recommends will be in the best possible interests of his customer.

In the normal commercial situation, such specialists make a charge for their services; giving advice and carrying out work in their selected field is their livelihood and the charges they make are set at a level which will enable them to recover the cost of the years of training which they undertook in order to gain a recognised qualification. It is also necessary for them to keep abreast of developments in their field by reading and attending professional conferences etc.

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In the industrial situation, the principles remain the same; the role of the maintenance manager and his staff is to give expert service to his "customers" i.e. the production departments or other profit earning parts of the total enterprise. In this case, salaries and wages, commensurate with the qualifications required and responsibility undertaken, are paid by the company concerned, who also, incidentally, pay the members of the production department on the same general principle. Therefore there is no necessity for charges to be made by maintenance people for their work for the reasons applicable in the commercial sense; they are adequately recompensed for their work by the payment made by their employers and indeed they have only one "customer" i.e. the Company. (A "charge" is made to the recipients of their service which represents the value of the time and materials expended, but this is fixed by the company accountants who must ensure that the cost of maintenance is recovered and that an appropriate allocation is made to the product(s) involved, as part of the unit cost.)

Another difference from the commercial situation is that the maintenance function is employed only to service buildings and equipment which comprise the company's assets

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and which are used for the purpose of furthering the company's objectives i.e. to provide goods or services for sale at a profit. The assets of a simple craftsman - for example, a carpenter - are the tools of his trade e.g. chisels, hammer, screwdriver etc. If he is to do good work, it is necessary for his kit of tools to be complete and not lack any item which will enable him to undertake all classes of work and to carry this out at a high standard of quality, with no waste of timber due to spoilt work. It is equally important that his chisels, saws, etc. should be sharp and well set, so that his rate of working is not slowed down due to blunt tools. In the same way, the "tools" of a factory are its machines, together with the power which drives them and the buildings which protect them, and it is equally important that these should not deteriorate due to neglect, slow down production due to breakdown, or produce substandard goods. Indeed, the economic consequences are greater in the latter case because if the return on investment which legitimately can be expected is not forthcoming, costs rise, profits fall, customers or goodwill are lost, and the end result, if corrective action is not taken, is the same. The craftsman who neglects his tools works slowly and turns out bad work; this eventually would lead to him being unemployed. In the case of the factory, when profit margins and production decline, it is

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only a matter of time before the company is out of business.

Hence it is possible to state quite positively a clear definition for the Maintenance responsibility as follows:-

THE MAINTENANCE RESPONSIBILITY

TO ENSURE THAT, AT MINIMUM COST, PRODUCTION MACHINES AND EQUIPMENT ARE AVAILABLE FOR PRODUCTIVE USE FOR THE SCHEDULED HOURS, OPERATING TO AGREED STANDARDS, AND AT MINIMUM WASTE.

This provides clear terms of reference for the Maintenance function as under-

1. The Maintenance Manager must equip himself with the necessary resources in terms of repair machinery, tools, and manpower, sufficient to meet his responsibility; he is however, required to do thus at the lowest possible cost, both in the short and the long term, consistent with providing an economic service.
2. His duty is to take the necessary action to ensure that the production plant is available for use by production personnel, in good running order, for the

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hours required by them to achieve their production quotas.

3. Where the result of his work can affect the quality of the goods produced, the standards of condition of plant must meet the criteria agreed with the production department.

4. In striving to achieve minimum cost, the Maintenance Manager must not do so at the expense of the quality of output which is unacceptable, or cause waste of materials passing through the production process.

The last point is particularly important; it will be of no benefit to the total enterprise if, by neglect or working to debased standards, the Maintenance Manager reduces the cost of his services substantially, and the amount so "saved" is more than offset by the cost of increased downtime and wasted production time and materials.

There is, of course, a complementary definition of the production function - that of the other party in this team. This is-

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THE PRODUCTION RESPONSIBILITY

BY THE USE OF MATERIALS, MACHINES AND LANPOWER,
TO PRODUCE GOODS OR SERVICES TO MEET QUALITY,
QUANTITY AND COST STANDARDS, FOR SALE AT A
PROFIT.

This means that -

1. Those in charge of production have control over the three key factors involved; they are required to ensure adequate supplies of the raw or semi-processed materials needed to fulfil the specification of the finished product.
2. They are also required to devise production methods, including the use of machinery, which will result in the conversion of the materials to the finished product.
3. These operations must be controlled to ensure that the agreed quality standards are met, (no more, no less.) The output must be regulated so that the production schedules, in quantity and kind, set by Management are achieved.

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4. All the components of the factory cost i.e. the cost of materials, the depreciation cost of machinery, power costs, maintenance costs, cost of direct production labour and factory overhead charges, must fall within the budgeted limits, in order that the selling price affords the necessary profit margin, to finance the further operations of the enterprise and provide a reasonable return to the investor.

It will be seen from the foregoing that the maintenance function is one of a number of services on which these responsible for production rely, and failure of any one of these will result in disruption of production. For example, variation in the quantity or the quality of incoming raw materials will cause this; slow or erratic supplies will interfere with the rhythm of production, resulting in low utilisation of plant and equipment and laying off of production labour. Deliveries at a higher rate than planned can also be a source of loss; storage accommodation will be overloaded and the stocks of material may deteriorate and become unusable. Shortage of production labour can also cause loss; machines are not fully utilised, work in progress builds up and output figures fall with resultant increases in unit cost and the prospect of increased labour charges if

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the deficiency is remedied by working the reduced labour force on overtime.

Even if all the above factors are fully under control and operating smoothly, this desirable situation can be completely negated by the non-availability of machines for periods of time which had been planned for production because of breakdown, due to failure on the part of the maintenance function to fulfil its basic responsibilities.

Clearly the ability of any of these services, including the production department itself, to meet all its targets all the time is a counsel of perfection, and the real art of administration is, after all has been done to bring all these potentially variable factors under control within the practical economies of the entire operation, to minimise the effect of variations which could not be predicted, or which were, by common agreement, accepted as a reasonable business risk. Systems will not take care of these occasions, and decisions must be made by fallible human beings; hence the need for the promotion of the best possible relationship between those with the responsibility of making such decisions.

continuously will preclude our carrying out any preventive maintenance. We feel sure it cannot be your intention to have to omit such essential service which takes approximately 8 hours per week.

**Memo. from Production Manager
to Maintenance Manager**

I must remind you of your basic responsibility laid down by Management and accepted by you i.e. "that you are required to ensure the availability of plant and equipment for productive use for the scheduled hours."

My scheduled hours will be 168 per week until further notice. How you achieve their availability for production is your problem; you are the engineer, and I expect you to give me the service which I have requested.

**Memo. from Maintenance Manager
to Production Manager**

I am sorry to see from your last memo. that

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you are taking up a rigid, legalistic attitude to the problem of increased production, which is the concern of us both.

I must point out that whilst I fully accept the fact that I am required to give you service, I also have a duty to Management to ensure that the Company's plant and equipment is preserved and not diminished in value due to neglect. Whilst I would be prepared to take a calculated business risk by omitting lubrication and some other preventive maintenance work for a short period of time to assist in overcoming a local production peak, I cannot consent to doing so indefinitely.

Secondly, you must realise that if your objective is to obtain the maximum possible output from your plant for an indefinite period, this will not be achieved by taking up time required for essential maintenance work. The hours of production actually achieved weekly are unlikely to be 168 after the first week or so; breakdowns are bound to occur to an increasing extent as time goes on. What is more, the involuntary stoppages are liable to occur at any time of the night or

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condition of two key machines, due to be replaced in nine months time, was such that regular preventive maintenance was essential if they were to be kept in service. Failure to do so was liable to result in serious damage which would take 30-40 hours to repair; hence, apart from other less serious instances of neglect, production in three weeks would be reduced to 128-138 hours per week.

He stated that he had examined the essential maintenance work programme necessary to keep all plant running, with only the normal business risk, for three months at this level, and could achieve this in 6 hours per week. He requested that production be planned on the basis of 162 hours per week, and offered to carry out the work at any time during the week which suited production best.

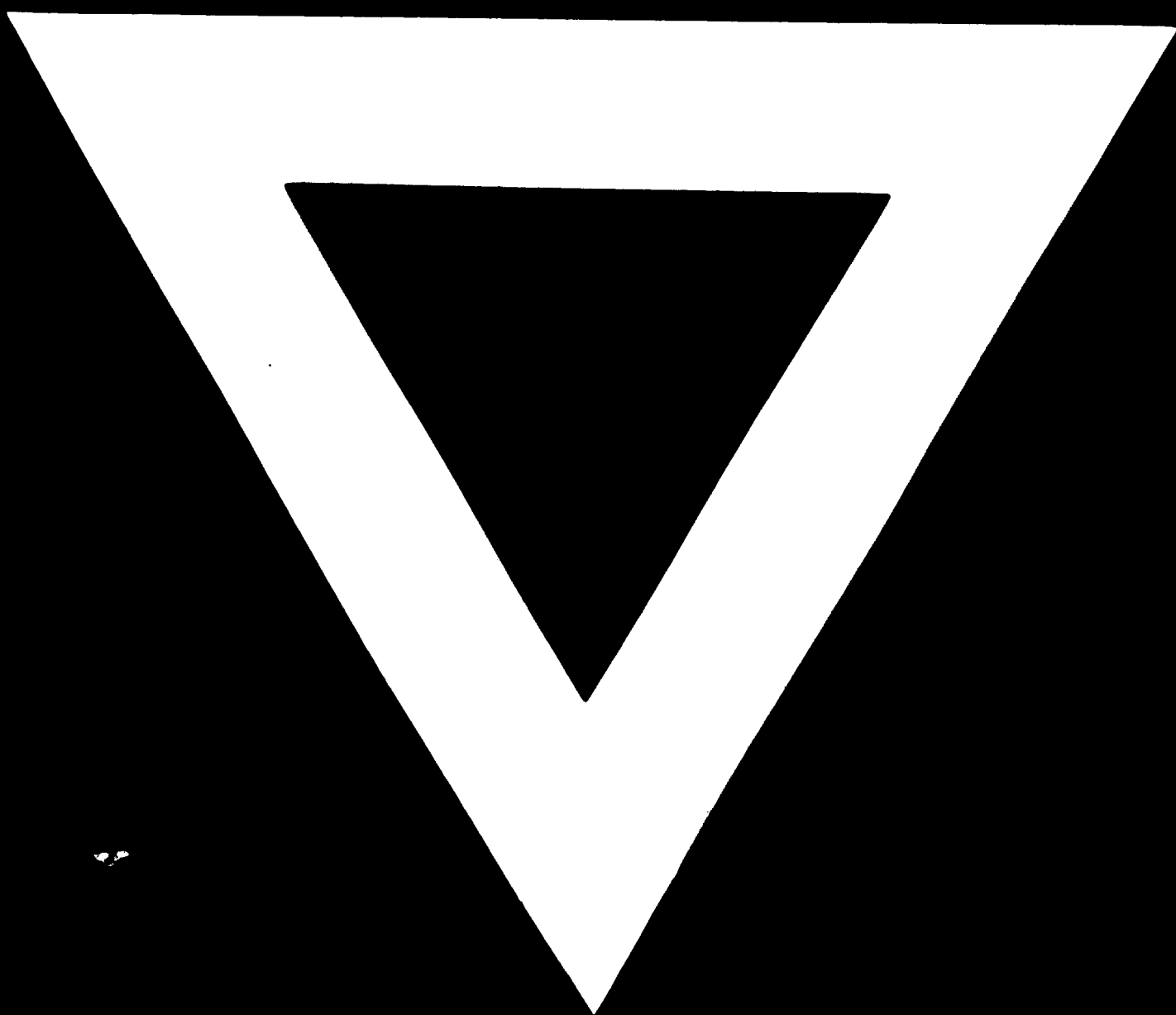
In reply to a question from the Production Manager, he stated that, if 168 hours production was insisted on, the cost would be prohibitive, because it would be necessary to duplicate several key items of plant, and this would have the effect of increasing the unit cost of production by at

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practice, even when this three month maximum
output period has passed; this will enable us
to reduce the cost of our service to you in
the future.

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