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## UNIT 5 MAINTENANCE ORGANIZATION

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### Objectives

After studying this unit, you will be able to:

- understand the components of maintenance organization,
- understand goals and objectives of maintenance organization,
- understand the key issues involved in evolving maintenance organization structure,
- define roles and responsibilities of maintenance team,
- develop a suitable maintenance organization for any plant.

### Structure

- 5.1 Introduction
- 5.2 Goals and Objectives of Maintenance Organization
- 5.3 Key Issues Affecting Maintenance Organization Structure
- 5.4 Roles and Responsibilities
- 5.5 Evolving a Maintenance Organization
- 5.6 Summary
- 5.7 Key Words
- 5.8 Self Assessment Questions
- 5.9 Bibliography and Suggested Readings

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### 5.1 INTRODUCTION

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The structure and organization of maintenance in some plants owes more to the origins of the plant, the nature of its business and the 'culture' in which it operates than to any detailed analysis of the maintenance needs of the plant. In most of these cases, efficiency is likely to be problematical. Today, in the early stages of the 21<sup>st</sup> century, we are surrounded by very high technology systems. Maintenance function in most manufacturing companies has little similarity with those existed earlier. The new mission of maintenance department is to provide excellent support for customers by reducing and eventually eliminating the need for maintenance services. This calls for retooling the traditional roles. On one side, the maintenance must merge with machine and tooling design to integrate maintainability improvements into design. On the other side, routine maintenance activity should be merged into operations. The creed of the new organization is that everyone must add value to the product.

*Figure 5.1* illustrates a model, which shows the larger number of actions and activities necessary for the successful operation of a maintenance department and encapsulates the formidable task facing the maintenance manager and his team. Even a single task such as that shown in *Figure 5.2* requires organizing ability of a high order if it is to be carried out successfully at minimum total cost (i.e. sum of downtime cost plus direct maintenance cost). In a large plant the tasks shown in *Figure 5.2* may number several hundred each day and it will be clear that this multiplicity of activities must be addressed in a logical fashion, otherwise chaos will result.

A maintenance organization can be considered as being made up of three necessary and inter-related components i.e.:

- **Resources:** men, spares and tools, of a particular size, composition and movement
- **Administration:** a hierarchy of authority and responsibility for deciding what, when and how work should be carried out.

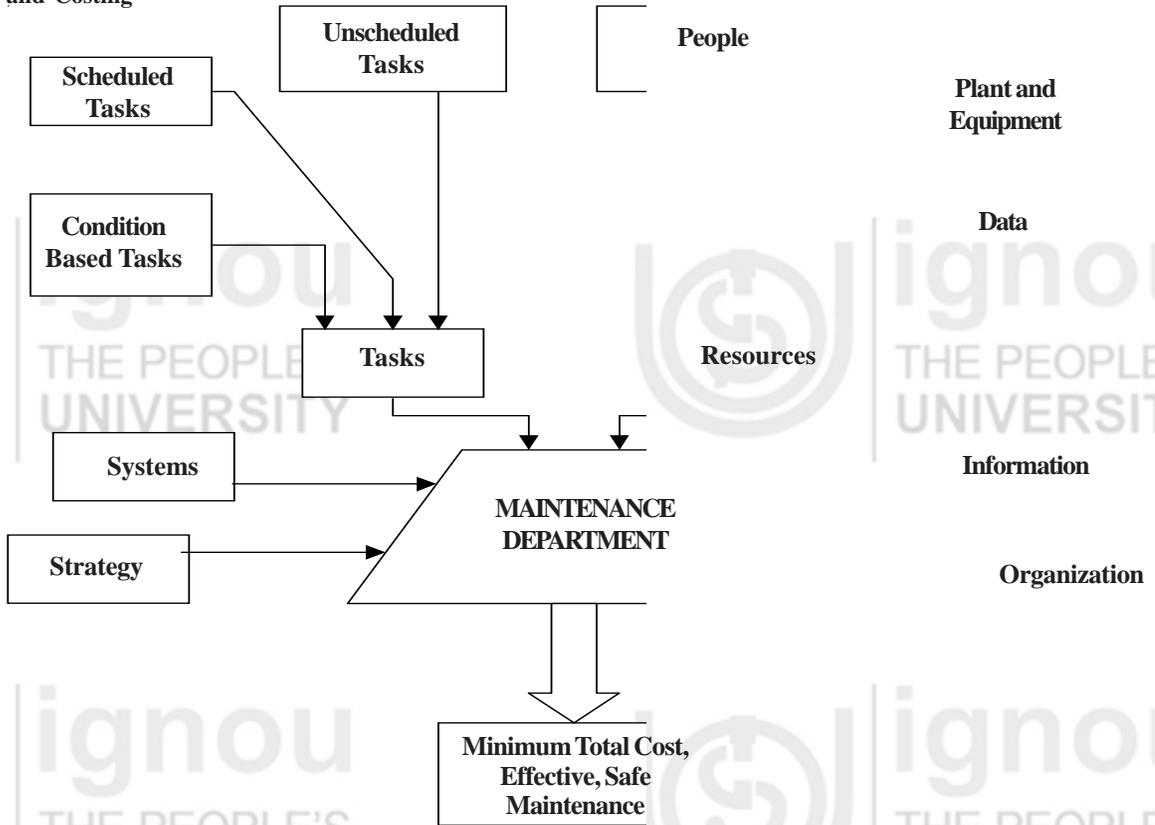


Figure 5.1 : Activities for a Successful Maintenance Operation

- **Work Planning and Control System:** a mechanism for planning and scheduling the work and feeding back the information which is needed if the maintenance effort is to be correctly directed towards its defined objective. Maintenance organization will need continuous modification to meet the changing requirements of present day production plant.

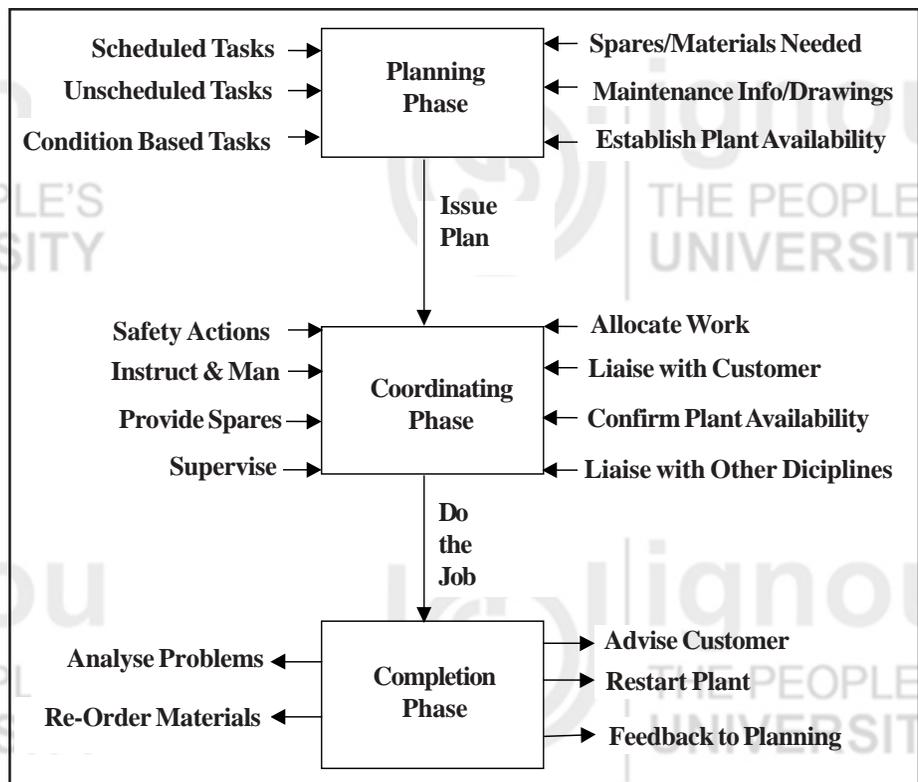


Figure 5.2 : The Phases of an Engineering Maintenance Task

## 5.2 GOALS AND OBJECTIVES OF MAINTENANCE ORGANIZATION

The typical goals and objectives for a maintenance organization are as follows:

- 1) **Maximum production or availability of facilities at the lowest cost and at the highest quality and safety standards.** This statement seems to be all encompassing and can be divided into some smaller components-
  - a) **Maintaining Existing Equipment and Facilities:-** This is the primary reason for the existence of the maintenance organization. Unless the equipment or facilities owned by the plant are operating or functional, there is no advantage in having them.
  - b) **Equipment and Facilities Inspections and Services:-** This is generally referred to as the preventive/predictive maintenance program. This activity is designed to increase the availability of the equipment/facilities by reducing number of unexpected breakdown or service interruptions.
  - c) **Equipment Installations or Alterations:-** This is not the responsibility of maintenance in all organizations, since installations or alterations are usually performed by outside contract personnel. As the maintenance will be maintaining the equipment, therefore they should be involved in any alterations or new equipment installations.

In viewing these three sub goals, the maintenance organizations will always attempt to maximize the plants resources, keeping the overall costs as low as possible, while ensuring the safety of personnel and the quality of the product/facilities.

- 2) **Identify and Implement Cost Reductions:** This objective is for the maintenance organizations to find ways to decrease maintenance and operations expenses. By examining maintenance practices, adjustments could be made in tools, training, repair procedures and/or work planning for reducing the amount of labor or materials that may be required to perform a specific job. In addition, any time gained while making repairs translates into reduced downtime (or increased availability), which is more costly than maintenance expenditures.
- 3) **Provide Accurate Equipment Maintenance Records:** A plant or machine history record is analogous to the medical history record kept by a medical practitioner. The regular perusal and analysis of plant maintenance records is the only sound and logical way of obtaining the information that will enable the management to take action based on factual data to raise maintenance standards and improve cost effectiveness.
- 4) **Collect Necessary Maintenance Cost Information:** This objective is also related to the previous objective. Cost information is divided into general areas like labor, material, tools and equipment, contract work, lost production and miscellaneous costs. Availability of accurate cost information helps in making a realistic maintenance budget and planning appropriate actions for future cost reduction.

- 5) **Optimize Maintenance Resources:** Making the most with the resources in hand is important in maintenance. There may be a very few maintenance organizations that have as many people, materials, or tools as they could use. As there is always a shortage of maintenance resources, they have to be used carefully. This can be achieved by proper planning and scheduling of plant maintenance work load.
- 6) **Optimize Equipment Life:** Any equipment requires proper maintenance if it is to deliver its desired service life.
- 7) **Minimize Energy Usage:** Equipment and facilities that are properly maintained will require less energy to operate.
- 8) **Minimize Inventory on Hand:** Since maintenance spare parts average 40 % of the total maintenance budget, reducing the on-hand quantities is a key issue. The costs of holding an inventory item in stock will average between 20% to 30% of the actual price of the item. Any reduction in inventory results in compounded savings.

**Activity A**

Visit your maintenance organisation or a nearby plant. List out the goals and objectives of the maintenance department.

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### 5.3 KEY ISSUES AFFECTING MAINTENANCE ORGANIZATION STRUCTURE

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1) **The Maintenance Environment**

In large plant, maintenance work will have to be carried out in what is frequently a very rapidly changing environment; which in turn may be due to internal or external pressures upon the company. The maintenance manager may not be in a position to influence that environment to any great extent. He or she should, however, be aware of the forces, which shape this environment. The organization can then be constructed in such a way as to give it the strength and feasibility to change rapidly with minimum loss of efficiency.

The factors which can change the 'internal' environment for the maintenance department, and which the maintenance manager must pay some regard to, include.

**External Factors:**

- Competition
- Loss of market share
- Politics
- Environmental pressures, i.e. green issues
- Legislation – National and International
- Labor mobility and new business in the area

**Internal Factors:**

- Industrial relations
- Employee motivation
- Incentive schemes
- Management changes
- New product launches
- Poor communications
- Poor results and economic drive
- Out-dated plant and lack of investment
- Skill shortages
- Lack of training (production operators and tradesmen)
- Resistance to change (management and shop-floor)
- Politics

The organizational structure for the maintenance department should be such that it can adapt to such changes in the internal environment.

2) **Coordination/Communication**

Only excellent communications, both vertical and horizontal, will be able to resolve the problem of coordinating and controlling the large volume of maintenance activities. Making use of numerous manual and computer based planning systems may help in adequate labor utilization. These systems are essential in a modern maintenance department if the working is to be handled effectively. Such systems have to be supported by a high degree of control over what people do and when they do it in order to be effective. This is unlikely to be achieved alone by traditional centralized organization.

3) **Effectiveness and Training**

A successful organization will not only control adequately that which is done, but will also take steps to ensure that the service is cost-effective by deploying the correct number of properly trained staff on each job and at the right time. This can only convince maintenance customers that the service they are receiving is effective. It is the job of the maintenance manager to take the initiative with regard to the training needs of the maintenance staff in respect of new equipment. This has to take precedence over organizational considerations and should in any event be the principal determinant in deciding the deployment of staff.

4) **Control and Bureaucracy**

Bureaucracy grows naturally in organizations, which strive to be efficient. Bureaucratic organizations with many specialist hierarchies tend to display very good control within the specializations but can become notoriously bad in respect of inter-functional communications, flexibility in relation to change, red-tape and coordination. For a good organization what is really needed is, in effect, two complimentary organizations. One largely bureaucratic- to maintain control and get the work done. And the other non-hierarchical mixing disciplines and levels in the business to solve problems. The maintenance manager will have to decide how much control can be forfeited and where it should be done in order to foster initiative, e.g. can multidiscipline teams be allocated to specific maintenance areas or projects whilst the remainder are controlled along traditional bureaucratic lines. It may be possible to delegate some maintenance work to operators and control the work centrally along largely bureaucratic lines, whilst allowing the most skilled men to operate in flexible problem-solving groups.

5) *Shift Versus Day-Work Maintenance:*

Most of the capital intensive plants have to be operated round-the-clock in order to achieve maximum return on assets employed. In most of these types of operation some shift maintenance will be necessary because of the high costs of downtime. Because of the expense of employing shift craftsmen and the difficulty of organizing and controlling the work output, most maintenance managers try to keep the number of craftsmen on shifts to a minimum consistent with dealing competently with breakdowns and other emergencies.

In general the following approach is found to be useful:

- a) Aim for the minimum number of craftsmen on shift consistent with meeting the commitments to the operation in terms of breakdown, servicing and safety.
- b) Select the most skilled, versatile and self-reliant people who can be spared (they will not have the benefit of all the back-up available on day-work)
- c) Do not expect all the planned work to be accomplished (strange things go bump in the night) but ensure that the plan includes a full shift's work for each group and also ensure that satisfactory explanations from engineering and production management are given if the planned work is not carried out.
- d) Consider the most appropriate deployment of the shift team and their geographical location on the plant in relation to the expected need for services, e.g. dispersed or centralized.
- e) Consider a call-out arrangement. This will suffice for some crafts. If one is in place are the arrangements satisfactory? For example, who has authority to call craftsmen to work and under what circumstances?
- f) Who is in charge under these circumstances? If not the maintenance manager, then who is? The maintenance manager should decide the number and mix of craftsman called-out in these circumstances. The person in 'the crisis' may not always be capable of taking an objective view.
- g) Naturally, if the organization has progressed to some form of production operator-maintainer under the control of a production supervisor then that supervisor will play a key role in organizing repairs, etc. and point 'f' above may not apply.
- h) Is there shift-working culture on the plant? If not, it may not be possible to obtain shift craftsmen at all and reliance may be put solely on:
  - i) Call-out arrangements, or
  - ii) Specialist service contracts with agreed contractual response times- which is expensive!
- i) For plants with Total Productive Maintenance (TPM) system it has been suggested that one only needs control technicians on shift since operating staff can cope with most of the other maintenance work necessary. Prerequisite to this must be inherently reliable plant, very well maintained with adequate stand-by facilities.
- j) With regards to costs, it must be born in mind that in continuous process plants one has to employ at least four craftsmen in order to provide one on each shift at all times. This has a large bearing on the numbers employed particularly when on night shifts the company is unlikely to achieve the same work output per craftsman when compared with day workers. In short, control is traded for the insurance of shift cover, and at significant cost.

6) *Centralised Versus Decentralised Maintenance Teams:*

External influences and company culture have had a very significant influence on the way maintenance departments were organized in the past. The idea of centralized control was not always appropriate to the needs of the business. By focussing on craft productivity and rigid control systems individual initiative was stifled. In trying to rigidly control the work of a craftsman to this extent it does not matter whether it is decentralised or centralised the outcome will be the same. By focusing on the maintenance needs of the plant as the first priority many maintenance departments in large companies have to a large extent decentralized the first-line maintenance teams (which, in the interest of economy, should be multi-skilled) but retained a centralized team to provide:

- central workshop/overhaul facilities
- specialized craft and technical services
- maintenance projects
- supplemental resources including contractors
- spares procurement and repair

The decentralized teams will work very closely with their production colleagues and in some cases have become part of the production team in the area. They have responsibility for carrying out (sometimes centrally controlled) maintenance plan and enjoy considerable scope for initiative and a healthy interaction with production staff. They have a very high vested interest in solving problems and preventing plant breakdowns because they, and they alone, will have to live with the pressures these situations create. For this reason, if for no other, they carry out the planned, preventive work to the best of their ability.

**Activity B**

Assess the organisational structure of your maintenance department as per the learning from the above reading.

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## **5.4 ROLES AND RESPONSIBILITIES**

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### **1. Titles, Job Descriptions and Accountabilities**

Despite all that has been said about clarity of organizational structure over many years it is still common practice to see 'deputy' or 'assistant' in large organization structures. The reasons given for the existence of such positions and titles are many and usually include:

- Help for overworked manager.
- To enhance the status (and pay) of the assistant or deputy.
- To cover the senior person's absence.

Whatever the motivation for creating these appointments they almost always create confusion as to who is the team leader and therefore the upward and downward authority and accountability. Moreover if one accepts that the structure should contain only whole jobs it is impossible to describe the assistant's job

without covering most of the “boss’s” job as well. Most people who have to report to such a structure are confused as to who is actually in charge, i.e. if the boss is at work what is the ‘deputy’ or ‘assistant’ responsible for? Who do the subordinates report to?

The main organizational evil of such appointments is that they split a real job into two or more parts and as a result no one has sufficient management challenge. This usually results in the deputy or assistant ‘making out’ or managing a level further down and creating frustration for someone else. If the manager is genuinely overworked then in most cases, it is better to create two real jobs with authority and accountabilities exclusive to them. If a deputy is needed to cover the boss’s absence why pay someone all year to duplicate his efforts. Why not appoint subordinates on an ad-hoc basis for absences.

In this way you can:

- a) Let the subordinates get a taste of being in charge with minimum risk.
- b) Let senior management see how the subordinate performs in the boss’s job.
- c) Rotate the deputies, and in this way avoid the ‘crown prince’ syndrome.

Job titles which include the word ‘joint’ need careful handling and really should be reserved for very short-term training of one of the job holders; otherwise they smack of indecision and compromise. Permanent positions of this nature inevitably engender the same criticisms as ‘deputy this’ or ‘assistant that’.

In the past, and it is probably still the case today in some plants, it was common to see very elaborate job descriptions for maintenance staff which, as well as describing the job in question, went into great detail about the responsibilities of the job holder. Unfortunately, in many cases the true reasons for the existence of the job (i.e. its outputs) were lost in a long list of inputs, if they were stated at all. It is nowadays considered essential in the interests of clarity to focus on the purpose of the job and what the holder has to achieve in order to satisfy the accountabilities.

If, in producing a description of a job within the organization structure, it is found necessary to write more than eight main accountabilities, one will find that in all probability he is specifying actions or inputs necessary for the achievement of the objectives or accountabilities and not the accountabilities themselves. The danger in this is that people may feel they are doing a good job so long as they satisfy all the inputs, which are listed. Whether the successful completion of these inputs satisfies the business objectives at that point in time is somewhat problematical. Firstly, because they may not be carried out at the right time and secondly, it is not possible to list all the actions necessary for any manager, much less a maintenance manager, to achieve his business objective.

There should be no prizes for the maintenance manager who has achieved a high utilization of the craft labour force if the plant is falling apart. In general the jobs within the organization that have any organizing responsibilities (including self-organizing jobs) should be described in terms of the output contribution that the job makes to the business. The objectives and accountabilities should be defined in terms of that contribution. If one cannot do that there is a real possibility that no job exists at all. As mentioned previously, it is far easier to see if a real job exists by working from the ‘bottom up’ not the ‘top down’.

## 2) Teams and Leadership:

On the assumption that some of the organization will consist of decentralized teams, either a mixed group of single discipline craftsmen or a multi-skill group, it is well to reflect upon what is required of the leader of this group. Question could be asked:

- Is the leader to be a working member of the group or a pure supervisor?
- Does the leader have to technically instruct the group members or is the team sufficiently well trained and motivated that the leader's role is mainly about planning, coordinating and resourcing?
- Is the leader a 'natural' one and hence 'in charge' all the time by common consents or should the nature of work dictate who will lead the team on each occasion?
- Would a self managing group fit in the 'culture' and if so could it be ensured that the essential preventive maintenance was carried out?
- If self managing how will one set objectives, on a team or individual basis?
- How will one appraise performance (everyone needs some kind of feedback)?

This type of decentralized team can be outstandingly effective if the team is fairly small but well balanced, with the right overlapping use of skills and ability, so long as they have clear objectives and at least one natural leader among their ranks. If there is more than one natural leader a close watch on the situation will be needed to ensure that healthy competition does not turn into destructive rivalry (but that, after all, is what management is about).

## 3) The Management Team : Authority and Accountability

The final issue is how someone and his management team looks at his roles within the maintenance department. What does the boss expect from his or her maintenance manager? Does the team and the boss accept that the responsibilities within the structure are reciprocal? That is, the team are responsible to the boss for the achievement of their objectives: the boss, in turn, is responsible to them for seeing that:

- they have sufficient training and experience to discharge their accountabilities
- they get a fair deal in return for their efforts
- they get at least as much help from the boss, as the boss expects from them
- the boss 'cares' and can be seen to care, about them as well as job
- the boss has the courage to deal with offenders in a way which is seen to be 'fair'
- the boss will communicate with them in a way which they understand and will listen to their views
- the boss will let them participate in 'management' to a greater or lesser extent
- that they know 'boss' and 'his' subordinates are there to help them do the 'right' work at the 'right' time and the 'right' cost.

It has been suggested that the usual organization charts should be drawn upside down to bring home to management and workers the inter-dependence of the whole team.

Natural justice would suggest that the degree of authority and accountability must be consistent at each level, e.g. no person should be held accountable for that over which they have no control or authority. The boss can choose to delegate his authority but not his accountability. Those to whom he delegates his authority are accountable to him for the discharge of that authority.

**Activity C**

Note down the responsibility shouldered by you in your maintenance department. How often you delegate your authority to others? Can you delegate the accountability to your colleague?

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**5.5 EVOLVING A MAINTENANCE ORGANIZATION**

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The design of a resource structure for a maintenance organization should aim to get the best balance between the utilization of the trade force and the quality of service it provides. The resource structure determines the geographical location of men, spares, tools and information, their function, composition, size and their logistics of movement. The objective of design is to achieve the best resource utilization for a desired resource response and work quality. The key decision making areas of resource structuring are:

- 1) **Trade Force Composition and Size:** Deciding the various trades and number of tradesmen allocated to each workshop or plant area. It depends on the type and amount of the workload, and the efficiency of work planning.
- 2) **Plant Specialization:** Deciding the extent to which the trade force is dedicated to the maintenance of a single plant, area or unit type. The advantage gained through plant specialization is improved work quality through greater plant knowledge and a sense of ownership. The use of a shared trade force helps in smoothing of the short-term work load and the easier and more effective application of work planning and control.
- 3) **Trade Force Location:** Deciding the pattern of centralised and distributed trade groups and workshops. Shared trade groups are normally located centrally. The advantage of decentralized groups is rapid response and a sense of team spirit with the other workers in the areas.
- 4) **Non-day Maintenance Cover:** Deciding the way in which maintenance activity outside the normal day work is resourced. The alternative possibilities include shift-working, overtime, call out, or some combination of these.
- 5) **Contract Labour:** Deciding the extent to which outside labor is used. Use of contract labor has advantage when used for resourcing labor demand peaks, for doing specialized work, and for reconditioning of units or assemblies.
- 6) **Location of Spares, Tools and Information:** Identifying an optimal, or effective, positioning of these resources. It is a secondary but closely related problem to the location of the trade force. Decentralisation of the trade force creates the need for decentralized sub-stores for tools and parts in order to facilitate rapid reponse.
- 7) **Logistics of Resource Movement:** Deciding how, and why, the resources are to be moved around the site. These decisions are secondary, but closely related, to those of resource location.



Information Technology  
(IT) Enabled Maintenance  
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Figure 5.3 : Decision Procedure for Establishing a Maintenance Administrative Structure

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Figure 5.3. gives a decision procedure for establishing a maintenance administrative structure. The design of maintenance administrative structure is concerned with:

- Determining the responsibility, authority and work role of each individual concerned directly or indirectly with the management of maintenance resources.
- Establishing the relationships, both vertical and horizontal, between each individual concerned directly or indirectly with the management of material resources.
- Ensuring that maintenance objective has been interpreted for, and understood by, each individual concerned directly with the management of maintenance resources
- Establishing effective systems for coordination and communication between each individual concerned directly and indirectly with the management of maintenance resources.

Evolving a best maintenance organization for a particular situation needs consideration of factors such as:

- 1) Maintenance work load and its pattern.
- 2) Amount of emergency work.
- 3) Cost of unavailability.
- 4) Geographical location of plant.
- 5) Size of plant.
- 6) Production organization.
- 7) Scope of plant maintenance departments responsibility for other secondary functions.
- 8) Work-force level of training and responsibility.

Figure 5.4 gives a typical maintenance organization chart. The top management in most organizations consists of Sales, Production, Research & Development, and Finance Directors. Production Director, whose main function is the procurement and operation of the plant to make the product, or supply the service to the customers secured by the sales department. This function is split into two equally important operations:

- a) Manufacture of the product or provision of service
- b) Providing and maintaining the plant, machinery and equipment to enable 'a' to take place. This is the responsibility of the maintenance manager.

The maintenance manager is typically responsible for five main responsibilities:

- 1) Plant Maintenance.
- 2) Maintenance Planning and Control.
- 3) Work services, which involves distribution throughout the works of electricity, oil, gas, compressed air, steam, air conditioning, town's water, drainage and effluent treatment.
- 4) Central workshop: All workshop services, which include a section concentrating on project work.
- 5) Maintenance Stores: The provisions of all the materials, spares parts and tools required to carry out the maintenance function.

The maintenance manager has the key role in managing the maintenance function. He is known by many different titles like engineering manager, maintenance manager, chief engineer, plant manager, maintenance superintendent, plant engineer, works services manager, and others. But by and large the function and the position is very much the same.

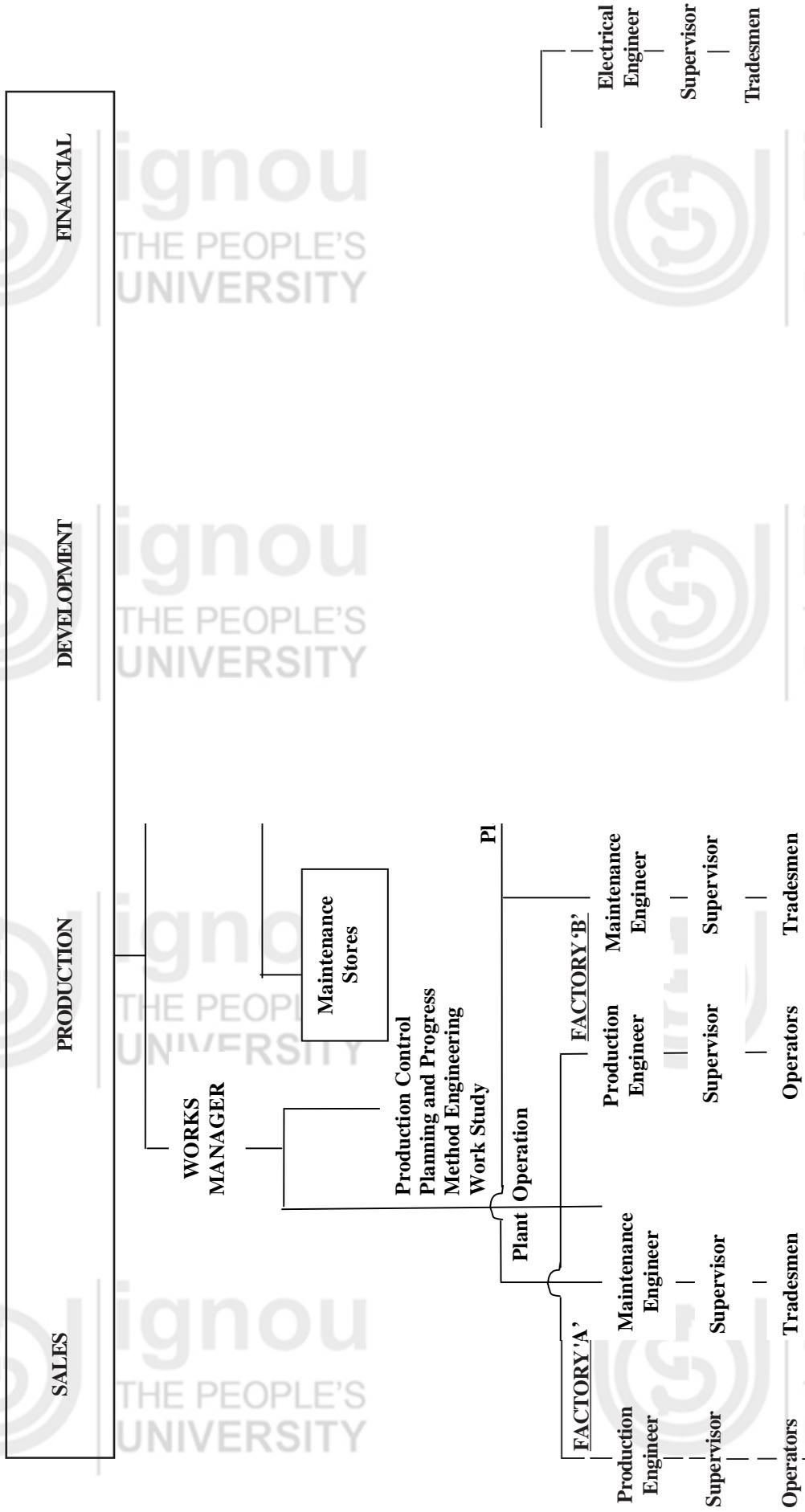


Figure 5.4 : Typical Maintenance Organization Chart

**Maintenance Resource Management and Costing**

The functions of the maintenance manager are as follows:

- Maintenance of fixed and mobile plant
- Selection, control and maintenance of work services
- The installation and commissioning of plant and services
- Budgetary control of maintenance and works services
- In collaboration with the production function, the selection of and purchase of plant and equipment necessary for production
- The selection of services, plant, equipment and consumable stores necessary for the efficient maintenance of all plant and equipment
- Control of staff and operatives necessary for the maintenance of fixed and mobile plant
- The control of the operation of fixed and mobile plant and all ancillary equipment from the viewpoint of maintenance safety
- The design of plant to ensure optimum operating efficiency and the reduction of maintenance
- The provision of consultancy services for the optimum utilization of plant, equipment or work services
- The education and training of maintenance personnel

**Activity D**

Visit a maintenance organisation. List out the functions of a maintenance manager in that organisation.

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**5.6 SUMMARY**

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A maintenance organization can be considered as being made up of resources, administration and work planning and control system. The structure and organization of maintenance in any plant should be based on the detailed analysis of the maintenance needs of the plant. The objective is to maximize production at the lowest cost and at highest quality and safety standards. The organization structure in any plant is affected by maintenance environment, communication, training, control and bureaucracy, shift operation, and the extent of decentralization. The roles and responsibilities should be described in terms of the output contribution that the job makes to the business. The degree of authority and accountability must be consistent at each level and no person should be held accountable for that over which they have no control or authority. The design of resource structure for a maintenance organization should aim to get the best balance between the utilization of the trade force and the quality of service it provides. The resource structure determines the geographical location of men, spares, tools and information, their function, composition, size and their logistics of movement. The decision procedure for establishing a maintenance administrative structure has been discussed.

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## 5.7 KEY WORDS

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**Management:** The act of controlling of maintenance within an agreed policy

**Maintenance Management:** The organization of maintenance within an agreed policy

**Maintenance Manager:** A generic term covering all those responsible for the organization of maintenance

**Project Work:** Modifying or improving a piece of equipment or system.

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## 5.8 SELF ASSESSMENT QUESTIONS

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- 1) What are the important components of a maintenance organization?
  - 2) What are the goals and objectives of a maintenance organization?
  - 3) Name the key issues affecting the maintenance organization structure?
  - 4) Give the factors, which can influence the internal environment of a maintenance department?
  - 5) What arrangement you feel will be useful for managing shift maintenance?
  - 6) In which situations will you recommend centralized control in managing the maintenance department?
  - 7) Will you recommend 'joint' or 'deputy' appointments in the maintenance administrative structure?
  - 8) What factors should be kept in view while deciding roles and responsibilities for maintenance personnel?
  - 9) Which are the key decision making areas in design of resource structure for maintenance organization?
  - 10) Explain the decision procedure for establishing a maintenance administrative structure?
  - 11) Which factors need consideration for evolving a best maintenance organization for an existing plant?
  - 12) Visit two nearby industries and draw maintenance organization charts for these industries?
  - 13) Suggest the best maintenance organization for the two industries you have visited?
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