# UNIT 11 HUMAN RESOURCE DEVELOPMENT IN MAINTENANCE MANAGEMENT

**Objectives**

After going through this unit, the students shall be able to

- get introduced to the modern concept of human resource management and its linkages with maintenance management;
- understand the expectation of the organization from the employees and vice versa;
- appreciate maintenance as a service function and human aspect of the maintenance;
- importance of training, developing training and creativity in maintenance technology.

**Structure**



## 11.1 INTRODUCTION

In the olden times an employee, especially a worker was treated more like a mindless machine than as a human being. Other than basic technical skills that he/she had to have, he/she was not given any training and was left to his/her own to improve himself. It was a case of survival of the fittest (as seen by his superiors) that

dictated his/her career path. This process never brought out the full creative potential even amongst the best of employees. Often, it brought out one's cunning ability to step on others for one's own success. There was no conscious or organized attempt towards developing talents, and attitudes, and relationships that could contribute to achievement of significantly higher level of performance of the individual and through him, the organization. Artificial methods of increasing output such as purely financial incentives and fear of dismissal had to be used. The enterprise, therefore, did not get the most out of its workforce. Managing such a workforce was quite stressful to the managers.

Conditions have changed a great deal in recent years. Global competition has forced management to look into ways and means of increasing productivity and reduce costs. At all levels technological advances have placed greater demands on the thinking process rather than just the physical side of work. The tremendous difference made to organization efficiency, morale of workforce, and relatively stress-free gain in productivity by companies that invested in the development of their employees has convinced most management that human resource development (HRD) is the fundamental and probably the most important responsibility/duty of the organization.

## 11.2 MATCHING OF EXPECTATIONS

To understand the meaning of HRD, one must ask what does the management of an organization want from the workforce and what do the individuals that make up the workforce want from their job. Once these matters are clear, the manner and method of HRD for a given organization will become clear. At this stage, it is important to recognize that HRD is a function and not a department exclusively dealing with this topic. As such, its activity and responsibility stretches across many parts of the organization and at many levels.

### 11.2.1 Expectations of the Organization

The explicit or implicit expectations of an organization from its employees are:

- **Skill of the Job:** A machine tool operator should handle the machine skillfully, safely and without damage, and should produce error-free product. A vehicle driver should drive smoothly at the right speed, practice good road discipline and laws and also take care of the vehicle. A clerk should know the related procedure, type fast and file documents correctly. A mechanic should correctly diagnose a fault in a machine, and repair it quickly and fully in minimum time etc.
- **Commitment:** The employee should show some responsibility to the task and not find excuses to shirk from work. He/she should show initiative and interest and solve minor work-related problems himself. He/she should also report to the superior, upcoming difficulties or growing problems that are outside his/her ability or authority to tackle.
- **Versatility:** Complexities of modern machines and workplace demand higher degree of specialization on the part of the work force than ever before. Yet, in many work areas tasks of different skills overlap. The employee must stretch his/her hand to take on a part of such 'gray' areas of work and achieve close coordination to save time. Also, sometimes there is a need for a person to do more than one task. In many cases, it is not even economical to employ a full time specialist for jobs that cannot load him/her fully. A versatile employee can be easily trained to take on new roles that are inevitable in the rapidly changing industrial scenario.

- **Team Spirit:** More and more of today's work is teamwork. A cooperative and mutually supportive attitude, willingness to go with others or take others with oneself, tolerance for different viewpoints, and having a sense of ownership about the team rather than glorifying oneself at the cost of the team, are the best indicators of team spirit. These can be inculcated but the individual must also be amenable to it.

- **Discipline:** An organization has to have procedures and rules of conduct in order to ensure predictability and to avoid chaos. This involves some restraints on everybody. Constantly rebelling against the rules simply to emphasize one's own independence is disastrous to the functioning of any group, department or even a whole organization. In this sense, the organization has a right to expect disciplined behavior from the employees.

From the managers, the organization has some additional expectations. These will naturally change according to the size and nature of the organization, but broadly these are:

- Professional knowledge of the business/industry/technology
- Skills of planning, coordinating and controlling work
- Resourcefulness and problem solving ability
- Being innovative
- Leadership qualities (including decision making)

**Activity A**

List out the expectations of your organization from you. Is the organization satisfied with you and your work culture?

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## 11.2.2 Expectations of the Employees

The expectations of managers and other employees from the organization are:

- Adequate monetary compensation
- Job satisfaction (Pride that his/her skills had been well utilized)
- Social interaction at workplace
- Fairness and justice in dealing by their superiors in particular and by the organization at large
- Opportunities for growth
- Stress free work culture
- Recognition by superiors
- Freedom to share/express his/her opinions and thoughts about work

These fit into Abraham Maslow's 'hierarchy of needs'. In the old days, the attitude of slavery at work prevented expression of the needs. With our enlightened society, protective labour laws, and fast communications, the modern employee has become aware and more vocal about them.

**Activity 3**

List out your expectations from organization you are working with. Is the organization meeting your expectation and the satisfaction level?

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## 11.3 ROLE OF HUMAN RESOURCE DEVELOPMENT

HRD can now be seen as 'developing the workforce in such a way as to match the organizational needs and the needs of its work force'. Implicit in this approach is the recognition that the work force is its most important instrument of growth. It is worth noting that in the Indian Army 'man management' has always been given the highest priority – even greater than professional competence and weaponry.' Man is to machine (weapon) as three is to one' is the refrain in military leadership, administration and training.

How can an organization grow unless its most important instrument itself grows? The term 'growth' applied to an individual in an organization means developing his qualities that make him more useful to the organization. Behavioral scientists have discovered that the individual's growth for self also contributes to the growth of the organization. A constructive look at the areas where the personal and the organizational expectations and needs could match or be complimentary, will help bring out ways and means to develop the human being as a resource. Some expectations are common to all, but other will vary to some extent with the job. For instance, the expectations of/from a research scientist would be different of/from a worker in a coalmine. Expectations of/from a machine tool/crane operator would be different from that of/from an accounts or stores clerk or a maintenance technician. This paper deals with HRD for maintenance, where the specific needs of maintenance have been considered.

## 11.4 AIM OF MAINTENANCE

Maintenance can have several aims, all of them ultimately converging on 'delivery of service in a cost-effective manner'. These aims are:

- To maintain a high level of equipment reliability and maintainability as contributors to production/operations.
- To maximize economy in equipment management for its entire life.
- To cultivate equipment related expertise and skills amongst maintenance.personnel.
- To create vigorous and enthusiastic work environment.
- To maximize overall equipment effectiveness through total employee involvement.

With minor variations, the role of maintenance in any organization can be seen as a support service to the plant and machinery being used in the plant for operations (as in an airline) or for production, or for administrative purposes (company cars, air conditioners, computers)

Achieving the above aims requires the following activities of maintenance:

- Technical advice at the time of selection of the machines.
- Assessment of spare parts, tools, accessories and work areas for maintenance.
- Technical Planning, control and coordination of maintenance activities.
- Training of appropriate maintenance personnel in maintenance technology, maintenance engineering, and maintenance management.
- Actual maintenance activities comprising of: installation of machines, preventive maintenance, condition monitoring, repair maintenance, shutdown/overhaul, manufacture and reconditioning of selected spare parts, and running own workshop facility.
- Advise operations on correct use of machines to prevent failures.
- Analysis of machine performance, failures, aging effects of components and system in order to review maintenance policies and parameters.
- Modifications to plant and machinery to improve yield/ output.
- Modifications to plant and machinery to improve reliability and maintainability.
- Support service to materials department, comprising of forecasting of spare parts requirements, technical advice on identification and preservation of spares in stock, and advice on selection of suppliers of spare parts.
- Constant upgrading of own technical knowledge and skills, and innovations in the area of maintenance.

**Activity C**

What are the objectives of the Maintenance Department of your Organization? Evaluate the top management's strategies, if any, to make a smooth and flawless maintenance function?

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### 11.4.1 The Human Side of Maintenance

Besides the above, there are some human aspects that must be considered, mainly due to maintenance being a service function. In any organization, the sales department gets the most visibility and recognition as it represents the visible source of profit. Operations/production department takes the next place, as it is the one that produces the product (or the service) for sale. Maintenance is perceived to have a negative role-a sort of necessary evil. Maintenance work is work behind the screen and the least visible one-or rather, visible at the wrong time i.e., when the machine fails. In a ship, the maintenance personnel are literally invisible – in the engine room, well below the waterline and rarely seen on the deck where the deckhands are the heroes.

Production and sales are measurable unambiguously. Maintenance work, even when measured, does not give clear indication to the management of its true contribution to the achievement of sales or production. Added to this lack of visibility, the absence of recognition of maintenance work further creates a low, almost martyr- like self-image of the maintenance personnel. This self-concept neutralizes any attempt to raise their

morale to a level where they can constructively take the demands and hardships of their service role. More often than not, they pass the elitism they see from production, on to the spare parts department personnel who serves them.

More than anything else, maintenance personnel need recognition of their contribution-not just in terms of monetary benefits, but by treating them as equal partners in the organization. Their next expectation is for some priority for the resources that they need for doing a better job. There is the classic case of a powered tyre-remover, which the maintenance department of a colliery was demanding for a long time. The total monetary saving due to the estimated reduction in the cost of downtime of the dumper trucks and of the labour hours for this very tiring job would have paid back the cost of the tyre-remover in less than Six months. Yet, it was not sanctioned, being 'too expensive'. Such repeated disrespect for their technical advice had affected the morale of the engineers. Low morale amongst maintenance personnel is at least partly due to partisanship on the part of management. Reversing this will greatly improve HRD for maintenance.

### 11.4.2 Interdepartmental Conflicts Affecting HRD

The most visible conflict between production/operations and maintenance is due to the former competing with the latter for getting their share of machine time-production for output and maintenance for preventive maintenance. When mature thinking prevails, this balance is well struck mutually and productivity rises. Even more important, their attitudes become mutually supportive, at least not antagonistic. When maintenance and production take extreme and unenlightened views about their role (and importance), there is an escalating conflict. Then production treats maintenance as a necessary evil while maintenance treats unproductive repair load-unproductive, because failures could be avoided if production were careful about operating the machines and spared them for preventive maintenance.

Hardening of such attitudes over a period of time makes for difficulties in HRD for maintenance (or for that matter, production, too). Evidently, an important part of HRD would be creating mutual respect for the personnel of these departments. This is the mutual responsibility of the two department-under the leadership and guidance of higher management.

There are many reasons for the above situation and also solutions. Amongst them, following are the main ones and need to be tackled:

- Ignorance/incompetence of maintenance in their professional areas, namely, maintenance technology, maintenance engineering, and maintenance management. (While maintenance may have some grounds to complain about their low status, the fact remains that unless their knowledge and competence is improved they cannot even begin to claim their rightful place of being an 'equal partner')
- Maintenance must learn to reduce repair effort by creative application of maintainability principles. This will give them time to study (and attend to urgent repairs).
- Maintenance must first establish a strong self-concept and identity. Going all out to undertake their role with utmost dedication alone can achieve this.
- Maintenance must learn to live with the fact that like God, services are forgotten after the crisis is over. This gives them a greater responsibility of convincing higher management and colleagues about their utility. They must understand that their role is to support the user of machine. This comes before everything else-even before own comfort. Towards this end they must seek to improve their competence

- Within the maintenance function, there has to be teamwork- mechanical, electrical and instrument/electronic technicians have to work in conjunction with each other. Without teamwork, there will be more waste of time, more buck passing if the repair is shoddy, and generally greater loss of morale and sense of ownership
- The teamwork must extend to sharing problems with the related maintenance disciplines, production/operations, and stores (in particular, the spare parts purchase personnel).
- Problem solving teams should be formed at the level of operators and mechanics. They should attack joint problems under the guidance of a 'steering committee' consisting of the senior level managers of both these (and other, related) departments.

**Activity D**

What is the conflict scenario among various departments in your organization in regards to the maintenance function? How do you resolve those inter-departmental conflicts?

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### 11.4.3 Career Path and Opportunities for Maintenance

In process industries and generally in all single plant enterprises maintenance is so closely involved with operations that many such industries treat operations and maintenance together- the discipline is called 'O & M" i.e. operations and maintenance. A typical example is that of electric power generating units. Engineers freely shift from operations to maintenance and back As such maintenance can rise to the Chief Engineer's position- which is the counterpart of the position of Chief of Production in the engineering industries and Chief of Operations in the service industries such as airlines or railways. In engineering production and service industries maintenance does not get the same status as in the former case. Yet, maintenance must rise to the challenge in order to create respect for the profession in the mind of those whom it serves. Recognition cannot come if competence- even mastery - does not exist.

As plant and machinery is getting more complex and more integrated there is recognition of role played by maintenance. Designers have to make these complex machines user—friendly, such as through automatic or remote controls. But this creates extra load for maintenance. Often the design becomes too compact for access, too integrated for speedy diagnosis. It is often downright 'maintenance-unfriendly'. In recent years, the concept of maintainability design has been accepted. In large organizations, which manufacture industrial plants, machines, or consumer durables, maintenance engineers are being employed in the design office.

### 11.4.4 Incentives for Development

It is difficult to precisely quantity the contribution of maintenance work towards increase in production. As such, bonuses and other forms of financial incentives for better performance of maintenance are given out broadly in some proportion to that for the production workers, like for other service employees. These provide inadequate motivation to maintenance personnel for their own development. However, some organizations give special incentives for self-development such as study leave for higher technical education, free membership of technical institutions and occasionally, monetary rewards. They work well provided they improve the promotion chances of the maintenance man who has utilized this incentive.

### 11.4.5 Stress in Maintenance

Pressure of work anywhere can cause stress. However, if the person is confident about success the stress stays within his/her limits and does not cause distress. A production worker's tasks are well defined and without uncertainty. The maintenance technician faces uncertainty, as almost every repair/maintenance job is different. Experience may reduce the diagnostic time on the relatively few but frequent faults. The large numbers of infrequent faults that occur in a machine force him/her to use trial and error. These create uncertainty and stress. The pressure of getting the machine back into service quickly creates time-related stress and haste at work. This breeds errors and more workload. Sometimes he/she is able to pass off a machine as serviceable to get the operations people off his back. But soon enough he/she gets it for a second repair—along with nasty remarks from the user about his/her competence. Stress also comes from the role conflicts, and non-appreciation from those whom he/ she serves. This causes the following unproductive behavior on his/her part:

- **Avoidance:** No initiative taken to locate the root cause of the malfunction. He/she tends to repair only that pointed out by the user of the machine. Under pressure of time, he/she does not attempt to identify and lurking incipient problems that may grow if unattended.
- **Non-accommodation:** Ignoring the user's request to give priority to any specific repair task.
- **Exploitation:** When user is extremely concerned about quickly getting the failed machine into operation, maintenance may deliberately take it easy to show their importance, or even demand some. 'Sops' from management e.g., overtime.

## 11.5 TRAINING IN MAINTENANCE TECHNOLOGY

A maintenance technician handle a variety of machines. Although he/she may specialize in a few, he/ she still has to have the ability to handle at least some other machines. While some general practices in maintenance are applicable to most machines, the designer or the manufacturer of the machine best knows the unique features of each. Typically, some of the adjustments in cars of different models of the same manufacturer and certainly those of different manufacturers are quite different. These are technology-dependent maintenance activities. Only the supplier can train the mechanics working on these cars. These training programs update the knowledge, skill and confidence of the mechanic.

From time to time the supplier would make modifications to the design, which affect the repair process. It is necessary to update the plant user's mechanics with these changes.

### 11.5.1 Training in Maintenance Engineering

The maintenance technology training referred to above is useful only to start off the maintenance engineer/technician for handling the problems that the supplier's clients had frequently reported to the former. These are usually included in the training. However, in terms of variety, these problems represent a small proportion (though significant in terms of frequency) of the total range of malfunctions/failures of the machine. A large variety of faults occur infrequently but they are spread over the years in the life of the machine. There is rarely a second occurrence to learn from experience. In these cases, the maintenance engineer has to use his own judgment and deductive logic to meet the situation of downtime caused by this large range of

infrequent failures. In these cases., most of the downtime occurs due to delay caused by the hit-and-miss type of diagnosis. The supplier rarely covers in the training on technology, the problems due to aging that appear in the later life of the machine.

Finally, the engineer has no guidance on improving on the design, operation, preventive maintenance, diagnosis, and repair techniques/technology of the existing design to make maintenance easier. This, too, is the task of maintenance engineering. A typical maintenance engineering training program should cover the following topics (at various levels of advancement):

- Maintainability design features
- Diagnostics and fault location; Fault-Tree Analysis (FTA); Symptom/fault Correlation;
- Basic theory or reliability and maintainability
- Weibull and other statistical analysis for assessing component and machine life
- Developing new repair techniques, tools and processes
- New repair materials
- Spare parts forecasting-essentially a combined statistical and engineering task

Maintenance engineering is the most neglected area of maintenance training. At the most basic level this means good workshop practice –the proper use of basic workshop tools and workshop machinery. Some of the topics mentioned about are relevant only at the advanced level.

### 11.5.2 Training in Maintenance Management

Management of maintenance relates to optimizing the resources of maintenance, namely, labour, accessories, workshop machines and tools, real time, and spare parts.

This training should include the following topics:

- Assessing manpower for maintenance tasks i.e., for installation, preventive maintenance, inspections, unscheduled and planned repair, and modifications.
- Scheduling the above tasks with available manpower and other resources.
- Obtaining the best results from own maintenance workforce through good leadership, human relations, team building, and motivation.
- Forecasting the requirement and time for maintenance tools, accessories, and spare parts.
- Using computers for the above, both for day-to-day work and for long term planning.
- Organizing own workshop facilities.
- Selecting and organizing maintenance work that is to be out-sourced (sub-contracted)
- Operating Company policies and procedures that are applicable to all employees

**Activity E**

Evaluate the maintenance training procedure in your organization or the organization you are acquainted with. What are your suggestions to improve pylon the existing one?

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### 11.5.3 Developing Creativity in Maintenance

Creativity is every human being's ability to think 'differently'. Since the maintenance man meets with different problems all the time, his creativity is frequently challenged. However, stress and a state of demoralization seriously restricts creativity and its huge potential for improvement in every sphere of work and personal life. To stimulate creativity, senior maintenance personnel should give challenging tasks to their juniors and allow them to handle maintenance problems on their own, as much as possible. This will also develop their confidence. Another way is for everyone to participate in 'Workshop Clinics', described later in this paper. Formal creativity training is not common in India yet, but training in Creative Problem Solving (CPS) using current problems, can be given within the plant itself. Publication of problems solved creatively by maintenance personnel in the house journal is also a strong stimulator. Incidentally, creative thinking and activity enables a person to better cope with stress.

### 11.5.4 Developing the Maintenance Leader

From a supervisor to the head of the entire maintenance department, good leadership is important. It is useful to know the well-known approaches to leadership and translate them into the development of the maintenance leader. Thus, leadership is seen both a process and a property. As a process it uses non-coercive influence to direct and coordinate the activities of group members towards goal accomplishment. As a property, leadership is a set of characteristics attributed to those who are perceived to use such influence successfully. While some traits are common to most leaders, their influence appears to be less than that of the match between the leadership style and the situation under which the leader has to act. For instance, Winston Churchill who was a giant of a Prime Minister to Britain during World War II was considered unsuitable to lead the nation during the peace that followed war. A very successful Chief Minister of a large progressive state in India was a miserable failure when he took over a ministry of the Central Government. The situations in maintenance range for the relatively peaceful, proactive planned work to highly reactive repair work and emergency work (accidents). The maintenance leader must be developed to handle both types of situations.

Many of the problems of effectiveness of a service organization or a department like maintenance arise out of lack of power to influence the practices followed or ordered by the higher management. A good maintenance manager must know how persuade recalcitrant higher management. This will not come from taking a 'blackmailing attitude' during emergencies but by developing impressive professional competence.

In an organization where maintenance personnel are treated as poor relatives or organizationally low-cast persons and not as equal partners, they transfer this elitism to their support departments, like the stores. This destroys teamwork and their own development. The maintenance leader must not fall a pray to this temptation but upgrade his own subordinates. Only then he can claim and obtain the status of an equal partner in the organization.

If the leader of a maintenance group attributes subordinate's poor performance to low effort or lack of ability, his responses might include a reprimand, training or even dismissal. On the other hand if it is attributed to external factors such as poorly designed task or work overload, the leader may in stead concentrate on correcting those problems rather than blaming the user, the supporting service (spare parts and stores department), or giving the subordinates negative feedback. Any negative feedback actually contradicts or even ruins the human development process. In this sense, the leader is also a mentor of his subordinates. His contribution to HRD is very high – a combination of personal example and mentoring.

### 11.5.5 Counselling

Every employee has some personal traits or domestic problems that affect his work, his ability to get along with others and to lead or to follow orders. The organization must have some counseling arrangements for persons who appear to be constantly under stress or unable to perform as expected. A qualified manager in the Personnel/ HR department who is familiar with company policies in the related areas best performs the task.

### 11.5.6 Institutional and In-House Training

Training in Maintenance Technology related to the specific machine is best received from the supplier. This is usually part of the machine supply contract. Full use of this must be made. Subsequently, own experienced technicians could train new individuals. The training material supplied to the technicians/engineers initially should not become the personal property of the trainee. The technical library should retain it for later use by others.

Professional bodies such as the Indian Institution of Plant Engineers, organizations having their own staff colleges, various management training institutions such as the Administrative College of India, the National Productivity Council and its regional and local branches etc., conduct short and long courses in training on maintenance management and for spare parts management. Every maintenance engineer should be exposed to such training. In addition, seminars on specialized subject are also held by these institutions. Maintenance engineers should be encouraged to read papers at such seminars or at least attend them to update their knowledge.

Training in Maintenance Engineering is available at two levels-for standard workshop practices at Technical Training Institutes, or the apprentice training conducted by large organizations such as the Army, Railways etc for own personnel. Training on the remaining advanced subjects referred to above, however, is not freely available to all. It has been mostly developed by large organizations such as the Corps of Electrical and Mechanical engineers of the Army, large units in chemical and other process industries. This training is restricted to their employees only. Institutes of Technology have recently started courses on such subject at the academic level. Presently, it is best for maintenance engineers to attend seminars on such subjects and do some practical application in their plant.

### 11.5.7 Self Training

Self-training is very important for all professions. In most respectable hospitals, all the doctors and other related professionals meet for an afternoon, every month or often to exchange notes in a ‘clinic’. New or unusual cases and treatments are discussed. Advances in the profession elsewhere are brought to the notice of the participants. If doctors can find time to do these ‘clinics’ regularly, surely, maintenance can do so, too. On this analogy, the Indian Army started ‘workshop clinics’ in 1980. These have since been adopted by the coal industry also. The participants are machine users, maintenance engineers and technicians. Service engineers of machinery suppliers offer additional technical inputs from their side and get to know firsthand, perceptions of the maintenance engineers regarding fault proneness and maintainability of their machines. Workshop clinic is probably one of the best form of in-house training of maintenance personnel.

## 11.6 INTRODUCING HRD FOR MAINTENANCE

The starting point for HRD is the senior most maintenance engineer/manager talking to his colleagues and subordinates and to take the following steps:

- Identify the short and long-term goals for maintenance; typically, reducing downtime of selected machines to a lower (specified) level; reducing cost on spares; increasing part rebuilding.
- For each goal undertakes a series of brainstorming sessions with related (interdepartmental) persons at mixed levels, levels, on 'deterrents that come in the way of achieving that goal'.
- Prioritize these and select a few (usually five to eight) key deterrents and carry out further brainstorming to identify why these deterrents existed.
- After this stage the major problem areas will become clear-as perceived by the participants of the brainstorming session. These will fall into five main classes: knowledge; skill; attitudes; workload; and organization.
- These problems must now be solved step by step, again involving personnel at all levels. These steps (such as developing excellence through various types of training, leadership, stress management, team building etc) have been discussed earlier in this paper,

An attitudinal change takes place in this process as employees get deeply involved and begin to 'own' the problem.. Problem solving by mixed teams will further strengthen the process. Training needs is clearly brought out in this way. Knowledge will be improved by training, both on the job and off the job. HRD will have to be a continuous and concurrent process in the twin areas of technical competence and human attitudes and relationships.

HRD is a non-stop process.

## 11.7 SUMMARY

HRD can be seen as developing the workforce in such a way as to match the organizational needs and the needs of its workforce. Modern concept of human resource management and its linkage with maintenance management is explained in this unit. The aspects of maintenance technology requiring attention in the training programs in maintenance management have also been brought out.

## 11.8 SELF ASSESSMENT QUESTIONS

1. What are the basic expectations of the organization from all the employees? List these.
2. What are the expectations of all employees from the organization?
3. What are the aspects and activities of the maintenance function?
4. Many organizations have standing conflicts amongst maintenance and production/operations employees. Describe the nature of these conflicts. What are the main causes?
5. What can be done to improve the negative image and low self-concept of maintenance?
6. What is the difference between maintenance technology and maintenance engineering?
7. What steps are needed to introduce and sustain HRD, Specifically for maintenance, in an organization?

## 11.9 BIBLIOGRAPHY AND SUGGESTED READINGS

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# 11.10 CASE STUDIES

## *Case-I*

### CASE STUDY IN HUMAN RESOURCE DEVELOPMENT FOR MAINTENANCE

[This is the story of how the neglected area of development of human resource received attention in a cement plant in Central India. It highlights the role of leadership in the process, with particular reference to HRD for maintenance]

Gaurav was recently selected for appointment as the plant manager of the cement plant of the R.P Organization, a family group that were in mining, sports goods and engineering construction. They were a progressive group who respected and depended upon the professionals in their units, which were spread all over India. The Chairman himself headed the selection board for senior appointment such as that of the Plant Manager for their large cement Plant. During the interview he was particularly impressed by Gaurav's humanistic approach towards the workforce. The previous plant manager belonged to the old school of thought. He had believed that work had to be enforced; that workers had basically no interest in work and that they worked because there was money in it. He believed that employees tried to extract the maximum from the Company through their trade unions. He also believed in extracting the maximum from workers—usually through harsh discipline or incentives like overtime.

With the changing social and industrial scenario even in these previously backward areas, this policy was not working any more. There have been threats of strikes though there were none yet. The old, loyal workers rather than the management had somehow managed to contain the young blood. The Chairman was looking for a replacement for the retiring plant manager. He found the right man in Gauraw, who believed in developing and not exploiting the human being.

Gaurav quietly took over his new assignment. He spent the first week in getting to know the plant, its technological features and problems, the labour relations, meeting with various government officials and also his major customers. Then he settled down to rebuild the production unit from first principles. The plant had a 'Personnel and Administration' department who basically handled salary administration, keeping records of individuals and meeting labour laws. He did not want to disturb their functioning immediately; though he had sensed that this department had become a big bureaucracy by itself. However, he asked Raghavan, the training manager, an enthusiastic qualified industrial engineer to be present in all his discussions with various individuals and groups during the next three weeks. This was a pleasant surprise for Raghavan. He used to meet the previous plant manager only at the weekly game of cards at the club. He often wondered whether the boss knew about his qualification and his task in the Company. He certainly had never asked.

Gaurav conducted his first discussions with his production sections and identified the bottlenecks to meeting higher targets. There were several, but the one that appeared to be the most troublesome one right now was the frequent failure of the crushers and kilns. Even the bagging plant was not working to full capacity because two of them were always 'under breakdown'. His production people had some unkind things to say about maintenance. As directed by Gaurav, Raghavan had kept notes of all these points.

Next morning the Plant Manager wanted Raghavan to tell him what was being done to upgrade the quality of work of the managers, staff and workers. Raghavan told him that there was hardly any training in the last two years that he had been there.

For a unit of this size there was no full time training manager. Though he was the industrial engineer for the plant he was also looking after the job of a training manager. But training was only for name's sake. Actually, he assisted the administrative manager in sundry, ad hoc work and any problem of job evaluation. Recently, when some new engineers and technicians were recruited he had suggested to the Plant Manager that there should be an induction/orientation program for them, firstly, to absorb them smoothly in the organization and secondly, to give them some training on the job in a planned way. But the Plant Manager wanted everyone to go straight on to the job allotted and learn whatever he could. If he were good he would learn. If he were not so good, he could be sacked. This is how the previous boss looked at induction programs.

By now Gaurav realized that there was no such thing as HRD in this plant had decided to give it his first priority. Amongst other things he, along with Raghavan, studied the complaints of the production men about maintenance. The list contained the following points:

Complaints from Production about Maintenance:

- Maintenance is insensitive to our needs of delivering the output, which the management demands from us at all costs.
- Maintenance takes too long to carry out repairs. This cuts into the uptime of the machines. How can we afford to spare them for preventive maintenance, which also takes up time? Repairs are shoddy. Within a short time of completing the repair the machine malfunctions and we have to return it to maintenance for attention. As a result, we do not send it for repair for minor problems; we send it only if the machine fails totally or is unsafe to operate.
- Maintenance technicians do not know their job well enough. There is a lot of hit-and-miss type of fault diagnosis and even repair. Some of our operators know more about the machine than the mechanics do.
- Maintenance is always making excuses for the delay—sometimes it is spare parts, sometimes for tools, and sometimes for shortage of labour.

After listening to these complaints, Gaurav talked to the maintenance engineers and a few technicians. They had another story to tell. Their list of complaints about production was equally long. In addition, they also had some problems with spare parts department. These were:

**Complaints of Maintenance about Production**

- Production does not use machines; they flog them. Proper start up procedure is not followed.
- Production ought to take greater care of their machines that give them their bread.
- Production does not spare the plant and machines for preventive maintenance in time. Hence, small faults grow till many more components are affected. This increases maintenance work many times more than if preventive maintenance was attended to.
- It also creates more emergency repairs that upset all our schedules of planned maintenance. That affects our efficiency.
- Production is all the time breathing down our neck during repair for speeding up work. This enforced haste is the main cause of shoddy, and patch type of work.
- Production - and even management-treat us as 'poor relatives' (elitism). Management never acknowledges our contribution to increased profits. Probably they are not even aware of it.

**Maintenance about spare parts (Materials Management):**

- Spare parts are never available in stock when we needed them
- We are blamed for excessive indenting. But how can we forecast the need for spare parts precisely when the failures are themselves random, and largely dependent upon the way machines are used? In any cases, we have to play safe. If they had not been ordered, management will blame us for the high cost of downtime of the machine that is held up for spares parts, the need for which we could not anticipate
- Spare parts are badly stocked, poorly preserved, and difficult to locate. We waste a lot of time getting them from stock. Also, the procedure for withdrawal is complicated and time consuming
- Stores are insensitive to our needs. They have more excuses than stocks

Since maintenance had some problems with the spare parts department, Gaurav talked to the purchase and stores people and got the following complaints about maintenance from them:

- Maintenance does not write the proper parts number or specifications to help the supplier and us so that the right spare part is supplied.
- They take too long to inspect the spares received from suppliers who complain about the delay in acceptance and payment
- We need help in preserving different high tech spares. But maintenance has no time for us
- Too often we are rushed to purchase spares that were not planned for by maintenance
- Many spares obtained under such emergencies, lie in stock unutilized for months.
- Maintenance evidently treats spare parts planning very casually. Actually, they have no idea of inventory control at all.
- When we advise maintenance to be realistic in the demands, we are told that it was for maintenance to demand what it needed and it was materials management's job to deliver the goods without delay. We really have no authority here and are treated very shabbily.

Gaurav was saddened to know all these matters. By instinct and from past experience in his earlier assignments he knows that there was some truth in all the complaints from all parties. He also knew that most of the complaints were inter-related to such an extent that it was not obvious as to which was the cause and which was the effect. As Plant Manager, he was responsible to see that the causes of these complaints had to be identified and removed. He also knows that he could guide his subordinates in general terms but they had to share the responsibility, too. He firmly believed that given the responsibility, support and some guidance, everyone could develop himself as an effective and satisfied member of the organization. He decided to give first priority to the development of the maintenance men – even before that of the production employees.

He called the senior maintenance engineers together and gave out his plan. He was able to convince them that learning and development were part of their daily job. He asked Dutt the Chief of Maintenance to talk to his people and make maintenance activity more producting. He further suggested that he could start with a 'Root Cause Analysis' to identify basic problems – not just the well-articulated, pre-conceived ones. He placed Raghavan at his disposal to assist him in any analyses, planning of training programs etc.

Dutt was initially somewhat skeptical, but decided to give it a try. He reported to Gaurav the progress after three weeks. Their conversation went along like this.

Gaurav: “Well Dutt, how is the program going?”

Dutt: “It’s been very interesting, Sir, I had heard about brain storming but never had an opportunity to see or participate in it. Reghavan explained to me the basics. Then I got all our engineers together one afternoon and identified our goals in a brainstorming session. We agreed that the immediate goal was to decrease the downtime of three of our critical machines, namely, the kiln, the stone crusher, and bagging plant No. 4. We had a free, unbridled expression of what we thought were the deterrents that came in the way of reducing the downtime of these machines by20%. I had consulted production first and they were quite happy about this target to start with. Gaurav: “ How did the boys take to the brainstorming session?”

Dutt: “Like me, initially they also blamed everyone else in the Company for our problems. Ragahavan had advised us patience. So, after the initial outburst in which the simmering discontent was let off, we started listing our own contribution to the problem-”.

Gaurav: “Such as?”

Dutt (Sheepishly): “Well, we realized that we never did anything to upgrade our own knowledge. Some of our engineers and technicians never parted with their specialized knowledge and some of their secrets about diagnosing some types of troublesome malfunctions-”

Guarav (interrupting); “Why was that?”

Raghavan: “I have talked to the boys about this. They admitted that since they did not get any recognition from management or from production, they had to claim it is this way. Then they felt important”

Gaurav: “I take your point. Everyone remembers God, the doctor, the soldier, and the maintenance man when something goes wrong. All are forgotten afterwards. I assure you that I will take steps to see that this does not happen here”

Dutt (getting a little bolder after this assurance): “Thank you, but I want to tell you something more. For the first time, my engineers have started discussing with their men our contribution to the downtime. They now want to conduct similar sessions with the technicians, who are actually curious and enthusiastic about it”

Gaurav; “That’s a good. Sign. You people often talk about being equal partners with production. You will now appreciate that first you must make their men your equal partners”

Some weeks went by. Dutt asked Rghavan to undertake an analysis of the pattern of faults in the selected machines. Raghavan was a trained industrial engineer. He quickly noticed the ABC pattern in the frequency of faults. This was intriguing to everyone. Then someone suggested that more than frequency they were concerned with repair load, which prevented them from attending to new faults immediately. In fact, much of the downtime was the time of waiting for repairs.

Another engineer volunteered to do the repair effort analysis. He found the same ABC pattern here too, except that the order of faults was different. After some discussion, they decided that the high frequency/high effort faults—there were only four or five for each machine – would be given top priority for reliability and maintainability improvement. Dutt wanted one engineer to concentrate on improving one fault at a time. Engineers happily volunteered and selected their faults for study.

They selected their technicians and began to do true maintenance engineering for preventing these faults or reducing their downtime.

They also vowed that for six months they would concentrate on improving their own competence and stop blaming anyone else.

Twelve weeks later, the first significant reduction in downtime was observed-at least some of the repeating faults had not occurred. Maintenance engineers were asking for technical literature and references for the machines. Senior technicians were correcting the 'bad work habits' of their juniors. Morale was slowly rising. Dutt requested and got approval for presenting the work done so far to the Plant Manager who also asked the production people, stores and finance to attend the meeting. This was more than what Dutt could have ever hoped for.

Dutt (with greater confidence than ever before) made his case: "Gentlemen, first of all, I want to thank our Plant Manager for giving me this opportunity to present the work done by maintenance in the last three months. There is no need for me to harp on the downtime reduction—it is there for every one to see. I want to mention about the most important lessons, which we have learnt in these three months. These are:

- The achievement is that of my men. They are my most valuable resource and
- Improvement begins with our selves.

"We concentrated on discovering problems created by us and taking steps to remove them. This was entirely under our own control. We did not need anyone's permission to improve ourselves"

"Previously, in stead of attending to this, we wasted time on bellyaching about the things that were not under our control. As we began to concentrate on self-improvement, others began to come out with a helping hand. For instance, Raghavan here went all out to get us the needed technical literature from other libraries. He even got funds from finance for three in-house, and two external,- training programs now planned for our engineers and technicians. The real training needs have come out of our discussions on problems, and not just as some theoretical ideas. The future training will be truly need-based. Our Plant Manager was kind enough to himself talk to his counterparts in other cement plants and arrange for our visits to learn from them, better way of maintenance. The process is continuing"

"Oh, I must also thank production. Lately, I have not got any missives from them in the weekly production conferences. Thank you for all that"

The production manager was quickly on his feet," Why should I blame you if your chaps were doing such a sincere job?" he said. Turning a little more serious, he added, "Actually, we are no less to be blamed for the frequent breakdowns. In the name of needs of production, we have delayed the annual cleaning of silo that stores the cement. Now it is choked. That causes backpressure and a lot of abrasive cement dust comes into the bagging plant and wears it out fast. I will immediately look into this. I admit that we, too, have been rather complacent about looking after our machines. I now believe that we could also borrow from maintenance, some ideas on developing our human resource. To start with, I would very much like my boys to participate in the problem solving teams set up by maintenance. Instead of simply passing the buck to maintenance they might learn to share the responsibility. Sir, perhaps we could all sit down one day and discuss how we could develop all our human resources better than we have done in the past?"

The Plant Manager agreed most heartily. Since other departments were also getting interested in this homegrown HRD activity, he asked Dutt to summarize the way he want about the improvement process so that others, and himself too, could also take a

cue.

Dutt narrated the steps as under:

- Identity the short and long-term goals for maintenance; typically, reducing downtime of selected machines to a lower (specified) level; reducing cost on spares; increasing part rebuilding. (Their immediate goal was reducing downtime of three machines).
- For each goal undertake a series of brainstorming sessions with related (interdepartmental) persons at mixed levels, with a view to identifying the deterrents that come in the way of achieving that goal.
- Prioritize these and select a few (usually five to eight) key deterrents and carry out further brainstorming to identify why these deterrents existed.
- After this stage the major problem areas will become clear— as perceived by the participants of the brainstorming session. These will fall into five main classes: knowledge; skill; attitudes; workload; and organization.
- These problems are now to be solved step by step; again involving personnel at all levels. These steps cover developing excellence through various types of training, leadership, stress management, team-building etc.

Dutt stated that he had realized that there was some truth in all the complaints (he preferred to call them perceptions) from production and materials departments about maintenance, and vice versa. Instead of being on the defensive or wasting time on counter-complaining about these, decided to tackle what was within the capability of his department. These and many other issues had come out in their internal discussions. Their new perceptions of the causes and solutions were as under:

- Ignorance/incompetence of maintenance in their professional areas, namely maintenance technology, maintenance engineering, and maintenance management. Which maintenance may have some grounds to complain about their low status in the organization, the fact remained that unless their knowledge and competence was improved they could not even begin to claim their rightful place of being an ‘equal partner’.
- Maintenance has to learn to reduce repair effort by creative application of maintainability principles. This would give them time to study (and attend to urgent repairs).
- Maintenance must first establish a strong self-concept and identity. Going all out to undertake their role with utmost dedication alone can achieve this. Maintenance must learn and accept the fact that ‘services’ are forgotten after the crisis is over. This gives them a greater responsibility of convincing higher management and colleagues about their utility. They must understand that their role is to support the user of machine. This comes before everything else even before their comfort. Towards this end they must seek to improve their competence
- Within the maintenance function, there has to be teamwork – mechanical, electrical and instrument/electronic technicians have to work in conjunction with each other. Without teamwork, there will be more waste of time, more buck passing if the repair is shoddy, and generally greater loss of morale and sense of ownership. The risk of an accident would also go up.
- The teamwork must extend to sharing problems with the related maintenance disciplines, production/operations, and stores (in particular, the spare parts purchasers). Problem solving teams should be formed at the level of operators and mechanics. They should attack joint problems under the guidance of a ‘steering committee’ consisting of the senior level managers of both these (and other, related) departments.

Gaurav was astonished at the great change in the attitude of the maintenance men. They were taking a very constructive view and the energy level generated by this approach was palpable. He declared his full support for the approach.

During the next few months, there were several brainstorming sessions to dig out all the deterrents to meet the goal. These were then prioritized at the level of senior maintenance managers. Problem Solving Teams were set up to tackle them. The Problems fell into following categories:

- Technological – specific to the design and operating technology of the machine
- Engineering – methodology, tools and accessories, workshop practice, new engineering materials, and statistical analysis
- Organizational and managerial – Planning, scheduling, and control, measures of effectiveness and performance evaluation.
- Human-Attitudes to work, self and other; relationship within the maintenance department and with other departments: physical; and mental stress of maintenance personnel.

The needs had now become quite clear. Since these were priority items selected by the senior managers under the leadership of the Plant Manager, it became incumbent on them to provide necessary resources for the development-resources of designs, procedures, training and general support for teamwork. Long-term plans were made (and implemented) for the development, HRD being given the first priority.

In all these discussions and decisions, various levels of employees—from workers to managers –were taken into confidence. Typically, workshop clinics began to function. Every one began to get a sense of ownership of the problems, the responsibility to solve them and implementing the solutions

A miracle was taking place. Maintenance was getting to be respected. Their advice was sought and usually accepted in the Company. When one of their managers reported the results of this experiment in a professional seminar elsewhere, some of the participants from that seminar visited the plant to see for themselves. One of them asked a passing maintenance technician as to who was responsible for their remarkable development. The man looked surprised at the question. He said, “Who is responsible for my uplift? Myself, who else? When I take the trouble to life myself up, others come to help me in the areas that are beyond my reach. God helps those who help themselves”

And that is the secret of Human Resource Development.

**Requirement I:**

What characteristics of leadership did the Plant Manager display in the HRD Process?

**Suggested Response:**

To start with, he created a rapport with maintenance personnel by listening to their problems. Then to start with, he encouraged them to unburden fully amongst themselves, identify the priority problems and begin to think about corrective actions. In this process he made them aware, without coercion or tutoring, of their own contribution to the problems, we well as their strengths. He focused their attention on setting goals in terms of the contractive target of reducing downtime, rather than asking them to change their thinking. This diverted their mind from pointing a finger to others or indulging in destructive self-criticism. He also gave them support by making the services of the industrial engineer available to them and supported the

training activities. He utilized every opportunity to involve other related departments to listen to the achievements of maintenance thereby helping them improve their self-image. In this process he also set into motion, team building at the operational and managerial level.

An important job of the leader is to develop his subordinates to take his place. When the leader things in these terms, automatically, he gets direction and ideas from his own mind to help develop them in all relevant areas.

**Requirement II :**

a) What are the areas of HRD and steps for introducing and sustaining it as far as maintenance is concerned?

b) Which area of HRD would you consider as the most important one for maintenance and why?

**Suggested Response :**

a) HRD for maintenance covers developing a strong self-concept, an attitude of service, and team spirit. It involves support from leadership, and training and updating in technical, engineering and managerial topics in maintenance. Training on maintenance technology can be initially obtained from the supplier; and training on maintenance engineering and management can be arranged at professional institutions. In all cases, greater emphasis should be given to continuous self-training, after the initial training is over. The attempt must be to creatively improve on where the start was made. This should be culture.

b) Like most other services maintenance generally feel neglected, unrecognized and low in the scale of importance given in the organization. This creates cynicism and low morale. It limits their ability to deliver their best in the areas of technology, engineering and management of maintenance. Hence, and most important aspect of HRD is raising their morale by developing their self-image, and their identity in the organization. This, in turn, means motivating them to work their inner strength. Taking on problems in a supportive atmosphere and solving them creatively slowly builds their confidence in themselves. Problem identification makes them conscious of their real needs in the area of training

## *Case-II*

### CASE STUDY IN HUMAN RESOURCE DEVELOPMENT FOR MAINTENANCE

Dump trucks (often called dumpers) are used extensively in hauling of ore and overburden in open cast mines. Next to drilling machines, they are the most important machinery in open cast mining. Their continuous availability is vital to production. They require regular and intense maintenance. During preventive maintenance, which may be up to two hours or more at a time, the dumper is not available for production. This irritates the production managers as it reduces the daily output. Besides, the dumpers also develop malfunctions from time to time and need repair, which creates unscheduled downtime of variable and uncertain duration. This downtime is usually much longer than that needed for preventive maintenance.

Shri. Ramphal, the mining manager in charge of an open cast mining area in the South East was an aggressive person. He drove his men hard. He had always achieved his targets in his previous assignment. However, in the present case, he was having problems due to insufficient availability of dumpers on road. Too many appeared to be waiting for or under repair and for too long. He had generally a poor opinion of maintenance and was constantly badgering Shri. Sampath, his maintenance engineer, for speeding up repairs. During the weekly production conference, he sometimes even humiliated him for his ineptitude.

Poor Sampath was demoralized. He had tried to convince the mining manager that unless preventive maintenance was given priority, breakdowns were bound to be heavy. It overloaded his staff and the spare parts supply system. They were already strained to the limit. Sampath had tried very hard to explain to him the logic of preventive and scheduled maintenance. Ramphal would have none of this. "You maintenance people have only excuses. I don't want to waste more time on preventive maintenance now. In any case, my job is to use the machines to the utmost and your job is to repair them-fast! I am not going to lose my earlier reputation of meeting all targets, just because of your inefficiency," He thundered.

Sampath was driven to despair. Around that time his old uncle, who had retired as the chief of maintenance after several years in a large mining complex in the South, had come to meet his father. Sampath shared his 'grief' with his uncle. In fact, he asked his uncle to find him a job as it was not possible for him to work with an unreasonable boss who had no faith in the logic of preventive maintenance.

The old man understood his dilemma. He remembered his earlier years and also the lesson he had learnt the hard way. He explained to Sampath, "Look, your role is to support production. Your preventive maintenance will show results only after some time-maybe a few months. Your boss is in a hurry to meet targets. Any talk, no matter how logical, of decreasing availability now for a long-term gain is going to fall on deaf ears. To be able to get your boss's attention and willingness you must learn to talk his language— the language of production". They talked some more and Sampath decided to act on his advice, though he was still a bit apprehensive about the outcome.

Sampath had never gone to his boss unless he was sent for – and that was always to receive a drubbing for something or the other. Time time he went to meet the boss, who admitted him after making him wait for quite some time. "What is you latest excuse?" was Ramphal's starting volley. "I am not giving any excuses, sir. I have been thinking about some ways of increasing our production. That's what I wanted

to talk about" Sampath said, somewhat hesitatingly.

"Production, did you say? OK, come along, sit down; let me hear what a maintenance man has to say something practical about increasing production"

"Sir, the rains will be on us in a week's time. For the next three months most of the dumpers would not be able to operate in the slush due to the heavy rains. My request is to allow me to carry out intensive preventive maintenance on all these machines during this period. When the production starts again after the rain I can guarantee that 100% of them will be on road". Sampath assured.

This was music to the ears of the boss. After some hesitation he agree to the proposal and immediately issued orders in the next conference to all production sections that every dumper must go for maintenance as scheduled by 'my maintenance manager' (Even his language was now different).

Sampath got his men together and explained to them his strategy. They heartily agreed. Working harder than ever before they completed the needed preventive maintenance. Three months later when the rains stopped the machines were looking almost new.

The boss was so pleased with this result that he was not only ready to accept the logic and need for preventive maintenance, he did something that he had never done before. Firstly, he thanked Sampath in the conference. Next, he ordered, "From now onwards, the first point, on the agenda for the weekly production conference will not be production targets – it will be maintenance targets. I want Sampath to issue a detailed program for every single machine and I want the production sections to confirm to me whether their dumpers had fully complied with the program issued by maintenance or not. God help anyone who hadn't!"

Sampath was in seventh heaven. With the boss's direct intervention and support, the scheme worked exceedingly well. It had to. As a result, six months later the boss was in seventh heaven. He had broken all production records in the whole Company. The average availability of his dumpers was the highest ever. He was handsomely rewarded for his achievements by way of faster promotion.

**Requirement I :**

What was the beneficial message given by the elder maintenance man for the development of the maintenance personnel so that they could undertake their service role effectively?

**Suggested Response :**

"A service department must understand the compulsions and priorities of those who they support and must use creative ways to develop conditions that will make that support possible".