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HCM 234

Facility Maintenance

Module 1

HCM 234 Facility Maintenance Module 1

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Published in 2021, by the National Open University of Nigeria

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Module 1

Unit 1Facility Maintenance Management

1.0 Introduction

Facility and equipment assets are big investments in the hospitality industry, and the establishments need to get the most out of them. In this unit, the basics for setting up a good and effective maintenance system are addressed.

2.0 Objectives

At the end of this unit, you should be able to:

- define Maintenance
- state the scope and objectives of maintenance
- explain Maintenance management and engineering
- state the functions of the maintenance department.

3.0 Main Content

3.1 Hotel Maintenance

3.1.1 What is Hotel Maintenance?

Hotel maintenance is the performance of general, preventative and emergency maintenance for a given hotel facility. It involves a combination of actions carried out to retain an item, equipment, system, plant or machine in order to restore it to an acceptable working condition. Maintenance procedures are performed in guest rooms, lobbies, elevators and restroom areas to ensure all equipment and materials are in proper working order. Hotel buildings face constant and heavy traffic, so it is important to keep everything running smoothly for the guests.

3.1.2 Scope of Maintenance

In the hospitality industry, the scope of maintenance covers the following:

- The grounds
- Site development comprising boundary wall, septic tank, storage tank, etc.
- Buildings, plants, machinery, equipment and systems
- Water supply and heating systems
- Drainage and waste disposal systems
- Gas distribution and fuel supply line system
- Ventilation, refrigeration and air conditioning systems
- Firefighting equipment

- Maintenance equipment and hand tools
- Laundry and kitchen equipment
- Telephone, television, telex, fax, e-mail, and other telecommunication systems.

3.1.3 Prerequisites of Effective Maintenance

For effective maintenance practice, the following points are vital:

- Good information for analysis of equipment failure mode
- Planning a maintenance programme
- Ensuring the availability of spares for equipment
- Keeping track of pending maintenance jobs
- Development of maintenance standards
- Evaluation and control of maintenance costs.

3.1.4 Objectives of Hotel Maintenance

The objectives of hotel maintenance are:

- To achieve minimum breakdowns and to keep the plant/machines in good working conditions at the lowest possible cost
- Machines and other equipment should be kept in such conditions which permits them to be used at their optimum capacity without any interruption or hindrance
- To ensure the availability of machines, buildings and services required by the customers
- To increase safety of guests/employees of hotels
- To maximise the availability and reliability of all the assets
- To obtain the maximum possible return on investment.
- To extend the useful life of assets
- To ensure operation readiness of all equipment required for emergency use at all times.
- To increase operational stability of the systems
- To increase the operational efficiency of facilities
- To increase customer satisfaction
- To ensure energy expenditure.

3.1.5 The Similarity of the Maintenance and Renovation Concepts in Hotels

Renovation is the process of retaining or improving the hotel image by modifying the tangible products, due to many reasons. Maintenance is seen as "restoring to, or retain a state in which an item can perform an initially specified function and all actions". This is done

through changes in the hotel layout. Such changes come in the form of new extensions and /or any additions or replacement of materials and furniture, fixtures and equipment.

Renovation incorporates replacement, restoration and redesigning. This makes it a function of facility management that deals with the physical aspects of hospitality and not 'soft' service element. This definition is therefore similar to maintenance because it requires inputs from many parts and levels of the organisation.

3.1.6 Maintenance Action

The maintenance actions may include:

- Inspection
- Measurement
- Testing
- Servicing, repairs, removal, replacement, cleaning, lubrication, adjustment, alignment, re-installation, modification, overhaul, re-building, reclamation, etc.
- Disassembly, assembly and check-out
- Securing material supply, storage of spares
- Preparation of reports about maintenance
- Contingency items
- Administrative duties.

3.1.7 Classification of Maintenance

Maintenance management can be categorised as:

- Maintenance optimisation models using programmeming and other software tools both qualitatively and quantitatively covering four areas involving description of technical system, its function and importance; identifying possible weakening consequences for a system; the description of the available information about the system and its objective function which helps in finding the best balance
- Maintenance techniques comprising preventive, corrective, condition based, predictive and outsourcing techniques among others
- Maintenance scheduling for maintenance personnel, repair rate assessment and wear out condition of equipment as well as scheduling for immediate and emergency job which are challenging areas in maintenance.
- Maintenance information systems which uses opportunity created by information technology and which have now become essential component of any maintenance in organisations
- Maintenance performance measurements used to assess effectiveness of equipment and other repair strategies. An effective performance measurement system is essential for effective functioning of any organisation as whatever gets measured has a higher probability of its completion

- Maintenance policies which deals with maintenance concepts and new ideas to improve management decisions.

Maintenance management has also been categorised by many writers into three maintenance procedures:

- Corrective maintenance (unplanned) approach which is a failure-driven maintenance referring to running equipment until unexpected event breakdown of equipment or malfunctioning.
- Preventive maintenance (planned) which entails time-based maintenance requiring regular task of maintenance irrespective of the condition of the item.
- Condition-based maintenance which also entails periodic inspection of equipment to check it and replace it when a faulty condition is observed before breakdown.

3.2 Maintenance Management and Maintenance Engineering

3.2.1 Maintenance Management

Maintenance Management is the planning, organising, directing, staffing, controlling and evaluating functions of management applied to maintenance activities.

The term 'maintenance' means to keep the equipment in operational condition or repair it to its operational mode. Main objective of the maintenance is to have increased availability of production systems, with increased safety and optimised cost.

Maintenance management involves managing the functions of maintenance. Maintaining equipment in the field has been a challenging task since the beginning of industrial revolution. Since then, a significant progress has been made to maintain equipment effectively in the field. As the engineering equipment becomes sophisticated and expensive to produce and maintain, maintenance management has to face even more challenging situations to maintain effectively such equipment in industrial environment. This lecture on maintenance management includes maintenance strategies, functions of maintenance department, maintenance organisation and elements of maintenance management.

Maintenance Strategies or Options
A maintenance strategy or option means a scheme for maintenance, i.e. an elaborate and systematic plan of maintenance action. The following are the maintenance strategies that are commonly applied in the plants:

- Breakdown Maintenance or Operate-to-Failure or Unplanned Maintenance
- Preventive or Scheduled Maintenance
- Predictive or Condition Based Maintenance
- Opportunity Maintenance
- Design out Maintenance

The equipment under breakdown maintenance is allowed to run until it breaks down and then repairing it and putting back to operation. This strategy is suitable for equipment that is not critical and has spare capacity or redundancy available. In preventive or scheduled

maintenance, maintenance actions such as inspection, lubrication, cleaning, adjustment and replacement are undertaken at fixed intervals of numbers of hours or kilometers.

An effective Preventive Maintenance (PM) programme does help in avoidance of accidents. Condition Monitoring (CM) detects and diagnoses faults and it helps in planned maintenance based on equipment condition. This condition based maintenance strategy or predictive maintenance is preferred for critical systems and for such systems breakdown maintenance is to be avoided. A number of CM techniques such as vibration, temperature, oil analysis, etc. have been developed, which guide the users in planned maintenance. In opportunity maintenance, timing of maintenance is determined by the procedure adopted for some other item in the same unit or plant.

In design out maintenance, the aim is to minimise the effect of failures and in fact, eliminate the cause of maintenance. Although it is an engineering design problem, yet it is often a responsibility of the maintenance department. This is opted for items of high maintenance cost that are due to poor maintenance, poor design or poor design outside design specifications. It may be mentioned that the best maintenance strategy for each item should be selected by considering its maintenance characteristics, cost and safety.

In addition to the above, new strategy concepts such as Proactive Maintenance, Reliability Centered Maintenance (RCM), Total Productive Maintenance (TPM), etc. have recently been evolved to look at it from different perspectives and this has helped in developing effective maintenance.

In proactive maintenance, the aim is to identify what can go wrong, i.e. by monitoring of parametres that can cause failures. In RCM, the type of maintenance is chosen with reliability of the system in consideration, i.e. system functions, failures relating to those functions and effects of the dominant functional system failures. This strategy in the beginning was applied to critical systems such as aircrafts, nuclear and space applications. At present, this is being extended to critical systems in the plant. TPM, a Japanese concept, involves total participation of all concerned. The aim is to have overall effectiveness of the equipment with participation of all concerned using productive maintenance system.

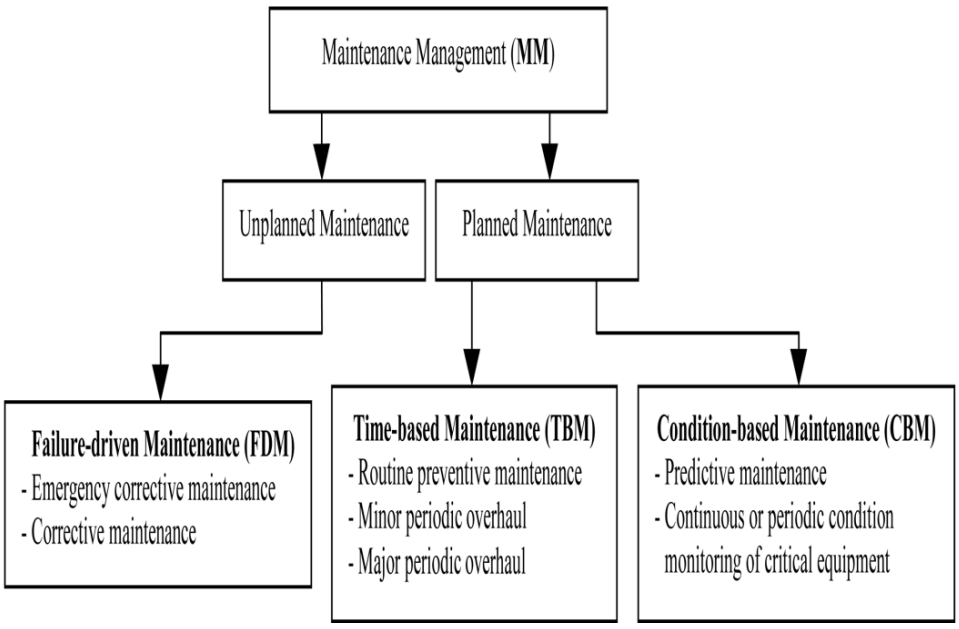

Figure 1.0: Three Commonly Used Maintenance Management Approaches

Management of maintenance activities in hotels is classified into four main categories. They are as follow:

- Routine
- Corrective
- Preventive
- Emergency.

Routine maintenance refers to the daily activities with repetitive nature, such as taking metre readings, lubricating, monitoring, start-up, and shut-down.

Corrective maintenance works are scheduled or unscheduled activities to restore the equipment to as-built functions.

Preventive maintenance includes scheduled activities of inspection, adjustment, replacement and overhaul to prevent system breakdown and extend its useful life.

Emergency maintenance refers to immediate actions to avoid further equipment damage and adverse consequences, such as loss of business.

Functions of a maintenance department

The following are the major functions of a maintenance department:

- Maintenance of installed equipment and facilities
- Installations of new equipment and facilities
- PM tasks – Inspection and lubrication of existing equipment
- CM tasks – monitoring of faults and failures using appropriate techniques
- Modifications of already installed equipment and facilities
- Management of inventory
- Supervision of manpower
- Keeping records.

Maintenance organisation
It concerns in achieving an optimum balance between plant availability and maintenance resource utilisation. The two organisation structures that are common are: Centralised and Decentralised. A decentralised structure would probably experience a lower utilisation than a centralised one but would be able to respond quickly to breakdowns and would achieve higher plant availability. In practice, one may have a mix of these two. A maintenance organisation can be considered as being made up of three necessary and interdependent components as follow:

Resources: men, spares and tools

Administration: a hierarchy of authority and responsibility for deciding what, when and how work should be carried out.

Work planning and control system: a mechanism for planning and scheduling the work and feeding back the information that is needed for correctly directing the maintenance effort towards a defined objective.

It may be mentioned that maintenance/production system is a continuously evolving organism in which the maintenance organisation will need continuous modifications in response to changing requirements. Moreover, it is required to match the resources to workload. Maintenance activities – be it preventive or condition monitoring, involve the use of resources- men and materials including documents. This requires coordination amongst the involved personnel so that these are timely undertaken. Work planning and control system under maintenance management in the plant ensures this and provides planning and control of activities associated with maintenance. This means application of general management principles of planning, organising, directing and controlling to the maintenance functions, e.g. to the establishment of procedures for development of maintenance strategy and to models for describing the flow of work through maintenance work planning department. The Control system controls the maintenance cost and plant condition.

Elements of effective maintenance management

An effective maintenance system includes the following elements:

- Maintenance Policy
- Control of Materials
- Preventive Maintenance
- Condition Monitoring
- Work Order
- Job planning
- Priority and Backlog Control
- Data Recording System
- Performance Measurement Measures or Indices

Maintenance performance for a plant or an organisation can be assessed through analysis of Reliability, Availability and Maintainability (RAM) plant data. Relevant parameters, measures or indices for specific plants can be identified. The performance over a period of time will show if it is improving, going down or being sustained. This will also help in knowing how well the objectives are being met. In addition, it will guide the areas which are strong and which need to be strengthened. Use of computers and dedicated software will certainly help in implementing this and the maintenance management system in general.

3.2.2 Maintenance Engineering

Maintenance Engineering is the discipline and profession of applying engineering concepts to the optimisation of equipment, procedures, and departmental budgets to achieve better maintainability, reliability, and availability of equipment.

Maintenance, and hence maintenance engineering, is becoming of increasing importance due to rising amounts of equipment, systems, machineries and infrastructures. Since the Industrial Revolution devices, equipment, machinery and structures have grown increasingly

complex, requiring a host of personnel, vocations and related systems needed to maintain them.

Objectives of Maintenance Engineering

The maintenance engineer's primary goal should be to continually identify opportunities of significant value to their organisation. These opportunities should relate to:

- Improvements in the specific asset environment (physical plant and equipment)
- Improvements in resource utilisation (people, materials, services and Enterprise Asset Management (EAM) systems)
- Improvements to the maintenance management processes–including the decision supporting management systems

Typical Maintenance Engineering Responsibilities

Typical responsibilities include:

- Assure optimisation of the Maintenance Organisation structure
- Analysis of repetitive equipment failures
- Estimation of maintenance costs and evaluation of alternatives
- Forecasting of spare parts
- Assessing the needs for equipment replacements and establish replacement programmes when due
- Application of scheduling and project management principles to replacement programmes
- Assessing required maintenance tools and skills required for efficient maintenance of equipment
- Assessing required skills required for maintenance personnel
- Reviewing personnel transfers to and from maintenance organisations
- Assessing and reporting safety hazards associated with maintenance of equipment.

Role of Maintenance Engineering

A maintenance engineer is responsible for the following:

1. Defining the organisation's Capacity Assurance objectives
2. Developing the improvement plan(s) to achieve these objectives
3. Identifying the resources and skill sets required to execute the plan(s)
4. Developing and supporting the implementation of effective Maintenance Management Systems, including the Maintenance Master Schedule
5. Monitoring the progress of the plan(s)
6. Ensuring the improvement(s) deliver the expected financial and operational benefits

7. Supporting the optimisation of maintenance costs. Maintenance engineers should be involved in budgeting the annual prescribed downtime and how that downtime will be spent on maintenance activities.
8. Providing advice and counsel on the design of new installations.
9. To lead the Organisation, doing whatever it takes, to continually improve the way maintenance gets done, often in step change fashion "in the beginning".

Self-Assessment Exercise

1. Define the term Hotel Maintenance?
2. State the functions of a maintenance department.

4.0 Conclusion

This unit has focused on the various aspects of maintenance management and engineering. Maintenance is expected to play even much bigger roles in years to follow, as industries and hospitality outfits worldwide are going through an increasing and stiff competition and increased automation of plants and systems. The down time cost for such systems is expected to be very high. To meet these challenges, maintenance has to use latest technology and management skills in all spheres of activities to perform its effective role in profitability of the establishment.

5.0 Summary

Hotel maintenance is the performance of general, preventive and emergency maintenance for a given hotel facility. Maintenance Management is the planning, organising, directing, staffing, controlling and evaluating functions of management applied to maintenance activities. A maintenance strategy or option means a scheme for maintenance, showing an elaborate and systematic plan of maintenance action.

Maintenance organisation is concerned with achieving an optimum balance between plant availability and maintenance resource utilisation. Maintenance Engineering is the discipline and profession of applying engineering concepts to the optimisation of equipment, procedures, and departmental budgets to achieve better maintainability, reliability, and availability of equipment

6.0 Self-Assessment Exercise

1. Discuss the scope and objectives of maintenance

2. Explain the following terms:
a. Maintenance management
b. Maintenance engineering.

3. Discuss the:
a. Role of Maintenance Engineering
b. Functions of the Maintenance Department.

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Unit 2Maintenance Planning

1.0Introduction

In unit one, we defined maintenance and discussed its scope and objectives. We also explained maintenance management and engineering. We then stated the functions of maintenance department. In this unit, we are going to be discussing maintenance practices.

Generally, hotels are complex and costly when it comes to maintenance, with various uses of spaces that have different schedules and uses for guest rooms, restaurants, health club, swimming pool, retail store and each has a functional engineering system required for its maintenance. Maintenance therefore has to be done throughout the year, requiring competent staff to undertake building services, operation and maintenance, supplemented by outsourced contractors. In the hospitality industry the maintenance of the engineering systems is important despite its complex processes as its effectiveness will directly affect the quality of hotel service, food, and beverage which have direct and significant effect on guests" impression of the hotel.

2.0Objectives

At end of this unit, you should be able to:

- explain Maintenance practices in hotels
- discuss Maintenance contracts.

3.0Main Content

3.1 Maintenance Practices in Hotels

3.1.1 Strategies in Hotel Maintenance

In the development of maintenance strategies and programmes, health and safety have become fundamental requirements for business success because they depend on good maintenance practices to avoid hazards in the buildings or workplaces. A maintenance strategy sets the direction of maintenance management, whereas the maintenance programme is a comprehensive schedule of maintenance works carried out in a specified period of time. Both however involve a high level of decision making because customer perception of quality is determined by a number of factors relating to services, food, facilities and indoor environment.

Management is willing to make every effort to improve maintenance management for energy savings. As such a sound maintenance strategy should be developed and implemented to keep the engineering systems reliable, safe, and energy efficient, satisfying customer needs and expectations.

Some factors that influence maintenance strategy adopted include:

- Health and safety

- Energy consumption
- Guest expectation
- Degree of influence in business activities
- Environmental Impact
- Hotel Policy
- Maintenance Resources (labour, tools and materials)
- Legal requirement
- Reliability of system
- Criticality of system
- System life cycle
- Annual budget
- Feedback from other departmental heads
- Manufacturer recommendations
- Equipment history records (failure mode, frequency and cause).

In maintenance practice, several factors are considered before adoption of in-house technicians; out-source contractors, or combination of both. There is no general rule for a desirable ratio of in-house to contracted-out labour force on which management decision is based, but the availability of resources and a number of other factors are considered. Limited skills of in-house technicians in specialised disciplines are the most significant factor driving management to employ outsourcing labour for some maintenance and retrofitting works.

Time constraints was considered as a factor since the main income of the hotels are from the rent of guest rooms and the provision of food and beverage services, including restaurants and banquet halls, therefore longer downtime of critical equipment and functional areas will lead to a serious loss of business. As a result, management has to carefully compare the working time needed by the outsourcing contractors with the in-house staff.

In-house and Outsourced Maintenance

- Influential factors for considering in house and outsourced maintenance include:
- Skills of in house technician
- Time constraint
- Statutory requirements
- Degree of system complexity
- Financial constraint
- Technical support from manufacturers
- Use of proprietary units and parts

- Availability of in house labour force
- Use of specialised tools and requirements.

In general, specialised contractors are better equipped and have flexible manpower that will ensure tasks are completed on time. Statutory requirements are also weighted. It is stipulated in local regulations that some activities, such as maintenance of fire protection systems, lifts and escalators, must be carried out by authorized contractors.

In the hotel industry the hotel operator is often criticised for trying to wear "too many hats" and problems with poor performing hotel restaurants are often attributed to differing core competencies required in hotels and restaurants. Outsourcing therefore represents a way to manage this diversity problem. Furthermore, a second factor motivating the hotel sector is labour intensity which creates tension between having the incentive to outsource in order to reduce labour management. However it demands monitoring sub-contracted activity outcomes.

Several factors make outsourcing particularly relevant to hotels because there is a high need for hotel managers to avoid being distracted from attending to core activities. Outsourcing strategy is the reassigning of control of an activity to a supplier and it is very different from contracting requiring challenging decision in at least three aspects. The decision to outsource is taken at a strategic level and secondly, it involves the restructuring of the organisation around its core competencies.

Outsourcing is often done for both tactical and strategic reasons. Tactical outsourcing is mainly based on a cost-cutting manoeuvre, with little consideration about risks linked to the decision. Strategic outsourcing deals with firm margins. Four specific issues which make outsourcing worth considering are:

Financial issues to lower fixed costs, gain tighter control of budget through predictable costs

O**perational issues** to get work done more efficiently or effectively by specialists, outsourcing to improve quality, flexibility, and deliveries

Resources and competence issues which gives the ability to focus on core assets by getting rid of minor ones. This gives access to innovation, knowledge and creates the conditions for relational capability building

Machinery and finally organisational issues which is outsourcing that responds to internal power issues and facilitates, the diffusion of new practices and forces to expand internationally.

Due to Transaction Cost Economics (TCE) the greater the asset specificity, the more likely a transaction will be internally managed (not outsourced). The hotel industry is characterised by much outsourcing, however, there is too much focus on economic activity and some aspects of organisational behaviour which are crucial for decision making are ignored. If a resource has strategic value to a hotel activity and has some potential that makes it rare, valuable, imperfect, imitable and non-sustainable, then it should not be outsourced because that resource must not be directly transferable in the market. This will make it easier for the firm to make profit, as it gains competitive advantage over other resources.

If a hotel possesses advantage when it comes to in-house performance, it is unlikely to outsource.

Finally, when a service can be provided more efficiently by third parties, it should be outsourced and activities which do not contribute to the development of core competences and of little strategic value should be outsourced.

3.1.2 Significance of Maintenance in Hotels

Many writers in hospitality maintenance have explained many different reasons, which make renovation essential for hotel operations. These reasons include:

- to carry on with the competition,
- to keep or increase market share by pleasing the current or impending customers
- to develop the operational competence of the hotel that will lead to an increase in both productivity and long term savings in operational expenses
- to retain corporate image and standards
- to promote the hotel to a higher class (e.g. from 4 star to 5 star)
- to conform with the new trends and technology in the market (e.g. the green movement)
- to handle governmental requirements like Disability Act, health and safety regulations in different countries)
- to make progress from natural disasters such as hurricanes and earthquakes.

Furthermore, maintenance is significant in hotels because room quality should reflect the price paid for it. When room rates are raised, it should be based on quality because guest must be able to perceive the quality increase.

In providing quality evaluation, hotels have been awarded "stars". More stars means higher quality hotels. On a yearly basis "star" rating increase or decreases in hotels. Managers losing star should then know that the hotel is beginning to lose ground when it comes to maintenance of amenities required to retain their rating.

3.1.3 Obstacles to Maintenance in Hotels

Some of the perceived obstacles to hotel maintenance include the following:

- Ownership could constitute barriers to renovation in both limited and full service hotels
- lack of money
- lack of appropriate in house experience and
- lack of suitable manpower to renovate.

Potential customers also have the means to picking up this signals and messages indicating lower quality. As such hotel managers should not fear increases in capital allocation when it comes to upgrading of the amenities of their hotels because the increased investment will bring increase revenue. There is much competition in this industry, so hotel management

planning should be focused towards upgrading "star" rating through maintenance of hotels' facilities.

3.2 Maintenance Contracts

Maintenance contracts are signed when hotel operators outsource completely to private hotel property management companies. These specialized maintenance companies usually bring in their staff to form in-house maintenance department. Most 5 -star and 4 -star hotels use this maintenance arrangement.

The other alternative is that hotel operators run their own maintenance departments usually common in small hotels. An agreement between the property owner and hotel operator specifies each one's responsibility regarding maintenance. The contract is for the duration of rent paid for the hotel, 3 years at a time, however the more hotel rooms rented the higher the revenue of the owner. Both parties have a joint interest when it comes to selling hotel rooms to acquire revenue. The hotel operator pays for cost of maintenance for all interior fixtures and fittings in hotel rooms and restaurant, whilst the owner pays for maintenance of the building, elevators etc. The hotel operator pays for all cost of maintenance when he is also the owner.

3.2.1 Acquisition of Fixtures and Fittings

All acquisitions for items are done by hotel operators based on their available funds and the design. The taste and impression of the guest is also usually considered before consideration is given to long term maintenance strategies. Some equipment requires changing of batteries so often and therefore expensive to maintain. Likewise, some fixtures and fittings get damaged very frequently because clients are violent and do not handle hotel items with much care as will be done in their homes. The rate of complains for repairs of damaged electronic equipment are therefore very high.

Changes in technology have led to the use of new fixtures that promote health, energy conservation. However, replacing them for a hotel with over 500 rooms is cost intensive hand this makes operators still maintain some old designs.

Secondly clients come from all over the world and have different tastes and desires when it comes to services provided by new equipment. Hotel operators therefore consider various factors before fixing new equipment. Energy conservation is the priority of hotel operators in the decision as to which modern and new equipment to buy.

For a hotel with over 500 rooms at least each room is visited once in a week to check faults for all fixtures and fittings in hotel rooms. Hotels with fewer rooms are visited more often. Air conditioners are serviced twice in a year and there is usually a contract to service these as soon as time is due. Actual daily maintenance is done as quickly as possible depending on how important it is for the hotel and the cost. Annually there are reviews of maintenance needs, new inventory prepared and items are purchased. This process is done as part of the budget process for the coming year. Each department identifies its need to keep the hotel in a good condition and running. Some new equipment installed are modern fire alarm in hotel rooms, LED-lights all over some hotels in order to save energy, new showers introduced to reduce the amount of water being wasted. However everything done is aimed at meeting or exceeding guest expectations.

3.2.2 Repair and Maintenance

Preventive maintenance is more often used and convenient because it is not appropriate for guests to check in and complain before repairs are done. There is the need to maintain guest confidence. It is easier to have a plan for manpower and financial resources when using preventive maintenance because it assists one to have a better cost control.

It is a problem interpreting the border between the responsibility of the property owner and the operator when it comes to maintenance cost because there are often different opinions on whose part it is to take the cost. The priorities of owners and operators are also different, as an example, if we need to buy a spare part for a hotel room due to a problem with air condition or something, hotel operators think that it is absolutely necessary to fix the problem the same day, whereas the owner often has another view of priority.

The second difficulty is money, when problem arises, it is here and now and you have to hurry to repair and make the room available. However, if money is not available to purchase spare parts, then in the long run, it creates a lot of maintenance issues. There are always issues on maintenance planning and cost of maintenance. One cannot do magic if the hotel does not have money.

Security men help with maintenance delivery at night to change locks and batteries when maintenance staff have closed, most times in most 4-star and 5-star hotels, a house keeping department is run alongside a maintenance department. The housekeeping department do the general cleaning up of rooms, changing batteries, fixing of bulbs whilst the latter has the technicians like carpenters and plumbers. Most 4 -star and 5- star hotels have adopted this practice and only maintain a housekeeping department and outsource the maintenance department.

3.3.3 Outsourcing and In-house Contractors

Outsourced contractors are used for painting, electrical, carpet cleaning, maintenance of elevators, annual oiling of wooden floors among others which require special competence in the field of maintenance delivery. They are therefore hired when the need arises. These services are also not needed every day and will be expensive to have stand-by technicians not doing anything. In house technicians are usually available. A combination of in-house and outsourced contactors are used by most hotels now.

3.2.4 Difficulties of Hotel Operators in the Implementation of Maintenance Plans

Acquisition of technicians
In the hospitality industry overcoming difficulties of recruiting the right technicians to work with is a challenging situation because hotels have policies on appearance so you cannot just employ anybody. Technicians' appearance with tattoos on body, long hair among others are not appealing to guest and not attractive because these technicians play dual role of repairs and meeting guests in their rooms and therefore need to appear neat and well kept. This difficulty in recruiting technicians for the hotel industry becomes even worst because craftsmen do not like this industry like other commercial properties like offices. Working in hotels requires more responsibility and much availability like from 7.00am – 7.00pm every day and even on weekends when offices are closed. Only few women technicians are also

available although the hospitality industry will be much interested in such people as work crews.

Availability of spare parts
There is difficulty in securing spare parts on time for delivery of work. Contracts to purchase spare parts only should be encouraged and handled separately by hotels. When costs of parts are not included in maintenance contracts, then cost will be on only labour charges for external providers.

Execution of maintenance plan
Maintenance plans for hotels have a duration of 10 years, requiring that for every 7th year you have to do redecoration, but this is usually not done. There are some hotels that have not been closed down for even one day since they were built in the 17th century. Planning and implementation at most are done whilst hotel is still running and this does not promote efficiency because execution of work is accompanied by noise and during the day guest are around relaxing, whilst in the night they are sleeping.

Execution of maintenance plan is also difficult because of poor budgeting for cost of maintenance by hotels. Budgeting for redecoration and refurbishing in hotels is a challenge to operators. These figures should be known and planned for because budgeting for future works and meeting your set target is a difficulty in the industry. Among several other factors, meeting or exceeding guest expectation on maintenance is very important.

Self-Assessment Exercise
1. State the four specific issues that make outsourcing worth considering.
2. State the difficulties in the implementation of maintenance plans.

4.0 Conclusion

This unit has shown that hotels adopt maintenance strategies that best suits their mode of operation. Today, there are many activities that are done to keep a building and its parts in good repair. Most of them are put under maintenance but the peculiarities of the hotel industry require that hotel maintenance is planned to be effective.

5.0 Summary

A maintenance strategy sets the direction of maintenance management, whereas the maintenance programme is a comprehensive schedule of maintenance works carried out in a specified period of time.

Some factors that influence maintenance strategy adopted include: Health and Safety, Energy consumption, Guest Expectation, Degree of influence in business activities, Environmental Impact, Hotel Policy, Maintenance Resources, Legal requirement, Reliability of system, Criticality of system, System life cycle, Annual Budget, Feedback from other departmental heads, Manufacturer recommendations and Equipment history records.

Obstacle to Maintenance in hotels include owners who could constitute barriers to renovation in both limited and full service hotels, lack of money, lack of appropriate in house experience and lack of suitable manpower to renovate.

Maintenance contracts are signed when hotel operators outsource completely to private hotel property management companies.

Outsourced contractors are used for painting, electrical, carpet cleaning, maintenance of elevators, annual oiling of wooden floors among others which require special competence in the field of maintenance delivery.

6.0 Self-Assessment Exercise

1. Discuss the significance of maintenance in the hotel.
2. Explain the difficulties of hotel operators in the implementation of maintenance plans.
3. Outline some factors that influence maintenance strategy adopted in hotels.

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Unit 3 Hotel Maintenance Staff

1.0 Introduction

In the previous unit, we treated maintenance practices in hotels with regard to strategies, significance and obstacles. We also looked at maintenance contracts and difficulties in implementing maintenance plans. In this unit, we shall be looking at hotel maintenance staff.

Hotel maintenance workers, while not often seen, are an important sector of the total staff that keeps a hotel running smoothly. Hotel maintenance jobs are needed to deal with everything from stopped-up drains to malfunctioning television sets and burned out light bulbs. Larger properties employ specialists for plumbing, electrical and other maintenance responsibilities, while smaller hotels often employ one or two maintenance workers who are adept at all the trades.

2.0 Objectives

At the end of this unit, you should be able to:

- state the types of maintenance staff
- describe maintenance staff response to maintenance requests
- outline maintenance/engineering department in the hotel
- discuss standard operating policy for hotel engineering departments
- describe the maintenance battleground.

3.0 Main Content

3.1 Types of Maintenance Staff

General Maintenance

Most hotels employ entry-level maintenance workers to handle the steady stream of repairs that are needed on the property, from changing light bulbs to touching up paint and repairing door locks. Entry-level maintenance workers typically do not need any formal education, but should possess a certain level of handyman skills so they can fix leaking faucets or help a guest log on to the property's network. General maintenance workers in hotels are always in demand. The position can be a good stepping off point to move into other positions within the property as well.

General maintenance and repair workers fix leaky faucets, do some painting and carpentry, make sure that heating and air-conditioning equipment work properly, mow lawns, and exterminate pests. The industry also employs cashiers, accountants, personnel workers, and entertainers. As properties acquire and use more sophisticated computer systems, they employ more *computer specialists* to help maintain these systems as well as the hotel's Web site, and computer connections for guests.

Engineers

Hotel maintenance engineers are more qualified to tackle larger repairs on laundry equipment, ventilation and water treatment systems, kitchen appliances and heating and air conditioning units and may hold special certifications in those areas. The chief engineer is

responsible for preventive maintenance checks on all the property's systems and often directs general maintenance staff to complete minor checks of rooms and conference facilities. Hotel engineers are usually required to earn a two-year associates degree in hotel maintenance and spend time working in a general maintenance capacity.

Grounds Keepers
Hotel properties with gardens and large outdoor areas employee specialized groundskeepers and landscapers to maintain the exterior of the hotel. Most landscapers at hotels are experienced in lawn care and shrub and flower maintenance. Groundskeepers usually maintain the parking lots and walkways as well as the planted areas and are required to be physically fit to push lawnmowers, trim bushes and run leaf blowers. At most properties, the outside grounds-keeping team also maintains the swimming pools.

Management
Hotel maintenance workers looking to move up to larger properties or into a management position can earn certifications geared toward maintenance management. The American Hotel and Lodging Educational Institute offer the Certified Maintenance Manager designation and the more advanced Certified Engineering Operations Executive designation to help advance a hotel maintenance career. In larger hotels, there are a number of levels of maintenance management that begin with supervisors' level up to executive levels.

3.2 Maintenance Staff Response to Maintenance Requests

Show up quickly
If there are delays in responding, contact the guests to let them know when you can reach them.

Greet the guest and introduce yourself
Rather than saying, "Hi, air conditioning broken?" say "Hello I am John from maintenance. I am sorry to hear you have had a challenge with the A/C and I am here to fix that for you."

Listen interactively
When encountering guests who are reacting emotionally, it is important to give them a chance to vent their frustration by allowing them to tell their "story" of the problem and how it has inconvenienced them.

Empathise and apologise
Guests seem to get more upset about the staff's reaction to the problem, rather than the problem itself. How many times have you read a guest comment such as: "What went wrong during our stay was…. But what really was upsetting was that no one seemed to care and no one apologised."

For properties with specific guest parking spaces outside of each ccommodation
Take note of the state listed on the guest's license plates. This gives you a great chance to express interest in their home state or perhaps comment on recent sports teams from that state. (Just be sure not to talk about politics, even if you agree with the messages on their bumper stickers!)

Always avoid blaming other staff, departments, or managers
Statements such as "They put you in this room?" or "We have had so many problems with these new TV's they just installed" only serve to infuriate guests that much more.

Interact positively with the children
Most are curious as to what the maintenance technician is up to and will want to watch attentively when safety allows.

Take ownership of the "physical product"
Maintenance and engineering staff are also out and about the hotel more than most other staff. This creates a great opportunity to help pick-up trash, straighten picture frames, and putting out wet floor signs when spills are noticed.

Anticipate guest needs
When maintenance have fixed a reported problem, always remember to offer to check other features related to the problem or that might have been off for the season, such as the temperature of the refrigerator, the gas line hook-up to the outdoor grill, and to turn on the Jacuzzi.
Of course, one external key to their success is the person who fills the maintenance service requests. It is important for them to ask the right questions to "triage" the guest's problem or concern. Often times by asking the right questions when the call comes in a maintenance call can be avoided.

3.3 Maintenance/Engineering Department in the Hotel

The maintenance or engineering department and front office communicate on room status and requests for maintenance service. Maintenance employees must know the occupancy status of a room before attending to plumbing, heating, or air-conditioning problems. If the room is reserved, the two departments will work out a period so the guest will be able to enter the room or be assigned to another room. Cooperative efforts produce the best solutions to sometimes seemingly impossible situations.

Likewise, the requests from guests for the repair of heating, ventilating, and air-conditioning units; plumbing; televisions; and other room furnishings are directed to the front desk. These requests are then communicated to the maintenance department. The front desk clerk must keep track of the repair schedule, as guests want to be informed of when the repair will be made.

The personnel and the equipment under their control provide the comforts demanded by the guests.

The maintenance departments affect the operation of the other departments of the lodging establishment.

The care and operation of the physical plant is largely the responsibility of maintenance department.

Duties of maintenance personnel

- Inspection
- Engineering.
- Maintenance
- Repair
- Overhaul

- Construction
- Salvage
- Clerical jobs.

Objectives of maintenance department are:

- Protect the investment in the physical plant
- Control the maintenance cost
- Minimise the energy cost of the facilities
- Minimise safety problems.
- Supply and distribution of power, water, etc.
- Reduce down time
- Provide better services to customers
- Provide higher market value services
- Provide services at lower cost
- Provide timely services
- Make life longer for equipment.
- Provide higher safety and morale for employees
- Provide better environment for community
- Provide smoother and continuous running of hotel.
- Provide efficient waste disposal system
- Ensure higher salvage value of equipment.

The functions of maintenance department are as follow:

1. Preparation:

- Maintenance request
- Repair of equipment under breakdown
- Assets/facilities register
- Introduce check list to prevent breakdown
- Maintenance Schedule
- Work/job specification
- Programming annual and weekly planned maintenance programme
- Planned lubrication
- Work priority
- Facility priority
- Safety.

2. Operation: Routine analysis, loading

3. Progression: Critical analysis Maintenance can be organised as:

- Centralised
- Decentralised - placed under shop/section superintendent
- A combination of above two
- It depends upon:
- Physical location of facilities
- Type of equipment in use and its age
- Availability of skilled maintenance personnel
- Layout and cost, work measurement, managing work Maintenance of equipment need the coordinated efforts of all concerned with hotel because:
- Maintenance is affected by the operational procedures, equipment, utilities, and service plans
- Equipment life is affected by the operational parametres
- Hotels are affected by the use of substandard raw materials processing, water, etc.
- Equipment getting affected and damaged due to scale forming, chocking of pipe lines, vessels, etc.

Traits of maintenance staff are:

- Patience
- Analytical mind
- Dignity of labour

Training of maintenance staff consists of

- General training (b) Departmental training
- Job specification training

Training programme should cover basic concepts and necessity of maintenance, documents to be maintained, compilation of cost data, factors affecting the maintenance cost, means to be taken to reduce maintenance cost and down time due to maintenance.

3.4 Standard Operating Policy for Hotel Engineering Departments

Major duties and responsibilities

- Implement a preventive maintenance programme of all building equipment and guest rooms
- Training of the Maintenance staff on executing the preventive maintenance programme
- Maintain inventory of all parts, and supplies
- Order all parts, supplies, tools, and equipment related to Engineering, through direct contact with sales representatives and in conjunction with Purchasing
- Follow up on projects and assignments given by the General Manager
- Ensure the proper operation, maintenance, and repair of all:
- Heater, pumps, valves, and lines used in the distribution of steam and heated or processed water
- Refrigerant compressors, condensers, evaporators, traps, transfer pumps, expansion valves, and stop valves as well as all refrigerant lines and devices used to control temperatures
- Air compressors along distribution lines and all valves and devices for air control
- Natural and manufactured gas and distribution lines, including all valves and control devices
- Water filters, softeners, piping and pumps used in conjunction with water distribution, including all sinks and water closets, as well as supply lines and water lines
- All types of motors or engines used to power pumps, compressors and fans.
- All types of locks, keys and locksmith related duties
- All electrical work and repairs
- Coordinate the maintenance, repair, and installation of carpentry work.
- Assure the implementation and follow-up of Companies Standard Operating Procedures
- Develop, recommend and direct the operation, policies, and procedures, plans, and programmes of the department
- Conduct a formal training programme on the required job functions and criteria expected, and a department orientation with new employees. Conduct monthly departmental meetings
- Administer required employee reference guide practices such as performance and aptitude reviews
- Oversees weekly work schedules in accordance with staffing guidelines and labour forecasts
- Assign duties and work responsibilities to staff members to insure that work schedules are adjusted accordingly to meet weekly business demands
- Coordinate breaks for staff
- Inspect grooming and attire of staff, and rectify any deficiencies

- Authorise requests for vacation/sick leave, holidays, leaves of absence schedule changes, and overtime
- (Pre-)approve bills and invoices, statements and work orders
- Enforce safety regulations, and investigate any accidents
- Maintain all mechanical equipment critical to the operation of the building
- Perform other job-related duties as assigned by management.

Managerial skill requirements

- Actively support the selection, development, training, mentoring, and empowerment of maintenance personnel
- Be a team player, and lead by example
- Provide constructive and consistent coaching, counseling, and direction tomaintenance personnel
- Manage time well, correctly prioritize tasks, and be accountable. Keep deadlines
- Manage the quality process in areas of internal customer service and associated guest satisfaction
- Demonstrate self-confidence, energy and enthusiasm through actions
- Present ideas, expectations, and information in a concise, well organised way
- Use effective listening skills as a basis for clear communication
- Provide appropriate recognition to motivate project personnel producing win/win results
- Manage group or interpersonal conflict situations effectively
- Understand how to manage in a culturally diverse work environment
- Use problem-solving methodology for decision-making and follow up
- Able to negotiate and create win-win situations with our internal customers

Technical skill requirements

- Adequate command of the English language to perform duties of position
- Adequate knowledge to maintain and troubleshoot general ventilation equipment
- Adequate knowledge to maintain, troubleshoots, and operates central air conditioning systems, as well as window/thru wall air conditioners
- Adequate knowledge to maintain and troubleshoot appliance and equipment including but not limited to; refrigerators, dishwashers, electric/gas ranges, toasters, and vacuum cleaners
- Working knowledge of plumbing, electrical, mechanical codes, national and local fire codes
- Adequate knowledge to maintain Occupational Safety and Health Administration (OSHA) requirement logbook and records

- Adequate knowledge to maintain and troubleshoot boilers, heating systems, hot water systems, and associated equipment.
- Adequate knowledge to maintain and troubleshoot electrical motors, controls, and systems
- Adequate knowledge to maintain and troubleshoot general plumbing systems.
- Adequate knowledge to maintain and troubleshoot electronic and mechanical lock systems
- Adequate knowledge to maintain and operate an emergency generator
- Adequate knowledge to maintain and operate high-rise combination Standpipe/sprinkler/fire pump installation and equipment
- Knowledge of blueprint reading, plumbing and wiring schematics
- Ability to accurately compute mathematical calculations
- Ability to prepare budgets and ensure cost controls
- Computer literate: Microsoft Word, Excel, and scheduling programmes.

The maintenance battleground

From the finest luxury hotels to the bargain extended stay facilities, the complaints remain the same. Guests want rooms that do not have:

Noise problems: Noise can be generated internally and/or externally. External noise comes from the parking lot, the room next door, the hallway, the emergency exit staircase or even a vending machine. Internal noise comes from squeaking ceiling fans, plumbing and room Heating, Ventilation and Air-conditioning (HVAC) units.

Dirty rooms/hotel maintenance problems: This includes dirty or grimy carpeting, dirty bedding, missing or non-working room amenities such as light bulbs, Internet access, electric sockets, ceiling fans, plumbing fixtures, remote controls, windows and doors.

HVAC issues: Ranging from noisy to temperature control as well as blowing across bedding.

Room smells: Room smell issues have a variety of causes. Smells come from smoking, musty air, stale air, previous smoking rooms, animals and mildew.

Insects and other pests: Insects like moist places with an available food source. Moisture can come from showers, high humidity, spills etc. Food sources normally originate with the guest in the form of food scraps (ants, mice) or improperly maintained bedding (bedbugs) but can also result from the moisture itself getting a toehold (carpenter ants, termites).

Check-in issues: This is the only major issue that is not preventable with a hotel Computerised Maintenance Management System (CMMS) maintenance programme.

The maintenance call to arms

The easiest way to do this is to look at the list above and tell which items can be prevented or minimised with preventive maintenance.

Noise problems: External noise can be mitigated with good weather stripping around windows, better windows and minimising door spaces. Sadly there is a limit to which preventive maintenance can help external noise. The true answer is better built buildings. On the other hand, internal noise generators such as HVAC units, squeaking ceiling fans and doors or plumbing issues can be addressed with regular inspection and/or lubrication.

Dirty rooms/room maintenance problems: Room maintenance is more than just having the cleaning crew come in and make the beds and do a quick inspection. Rooms should be inspected regularly for a list of common complaints. Some items can be fixed on the spot (missing light bulbs, non-working remote controls) and some may need to be accumulated (electrical sockets not working, mold buildup, carpet stains) before maintenance is scheduled. All safety issues should be scheduled for maintenance as soon as possible to avoid hotel maintenance liability issues.

HVAC Issues: Heating, ventilation and air conditioning (HVAC) noise issues and temperature control problems can be addressed through inspection and preventive maintenance. Better maintained HVAC units/controllers will save energy for the hotel. Central air vents should be kept clean to avoid mildew and dust issues.

Room Smells: Once an odour has permeated a room, bedding must be changed and upholstery cleaned. Inspections note when a room has a distinguishable odour and that needs to be cleaned thoroughly. The availability of fresh air is a hotel or resort decision. Do windows open, are HVAC filters clean? If central air is used, what percentage of the air is re-circulated? How well are the rooftop units being maintained?

Insects and other pests: Insects attract predators, without constant inspection and pest control; insects can not only scare away guests but also cause physical damage to the hotel.

Check-in Issues: External power issues or centralized reservation system glitches are beyond the scope of regular hotel maintenance. However, computer equipment can be checked in any establishment for dust build up on fan motors or connectivity issues. Local equipment can be made to last longer with proper care.

The maintenance scheduling/manpower battle

Realistically, there are only so many light bulbs, guest caused or wear and tear issues that hotel maintenance staff can address in any given time period. As assets age, it becomes harder and harder for hotels to balance the needs for unplanned maintenance with the goals of a proactive maintenance programme that includes inspections and preventive maintenance to maintain or extend the useful lifecycle of equipment.

The question for hotel and resort owners and management is what is the cost differential between attracting new customers and getting customers to make return visits by reducing guest maintenance complaints. The answer can only come from knowing how much it costs to maintain your assets in a way to maximize their useful lifecycle in the most cost effective manner.

CMMS technology will win the war

The key to knowing your costs is, understanding the hotel work order lifecycle, eliminating manual procedures, automating paper functions, and finding the correct balance between reactive and proactive maintenance. The tool of choice for this task is, a Computerised Maintenance Management System (CMMS). Using a hotel CMMS helps hotel maintenance

managers organise their work flow (inspections, preventive maintenance and unplanned maintenance) in the most time efficient manner.

Once the work is organised, the work order system records all maintenance activity including time spent, cause, parts used, costs, results and notes. This information can then be summarised in management reports enabling management to make better repair or replace decisions as well as identify trends or common causes that require changes in operating procedures.

Lastly, a CMMS software solution takes the maintenance history and creates a database that can be used for budget analysis, capital expenditure forecasting and a calculation of true asset maintenance costs. Most hotels will find that a CMMS for maintenance is much cheaper than the marketing budget required to attract new customers.

Self-Assessment Exercise

1. Mention types of maintenance staff
2. Itemise the duties of maintenance personnel

4.0 Conclusion

The maintenance department of a hotel is solely responsible for physical plant facilities, which includes operation, maintenance and repair of all heating, ventilation, refrigeration, mechanical equipment, and grounds of the hotel. This department is also to develop, coordinate, and monitor a room's maintenance programme to ensure the safety and comfort of guests and staff. It is also saddled with the additional responsibilities of training and supervising the departmental staff.

5.0 Summary

Types of maintenance staff are general, engineers, grounds and management duties of maintenance personnel, inspection, engineering, maintenance, repair, overhaul, construction, salvage, and clerical jobs. Traits of maintenance staff are patience, analytical mind, and dignity of labour. **Training of maintenance staff consists of** general training, departmental training**,** and job specification training. Training programme should cover basic concepts and necessity of maintenance, documents to be maintained, compilation of cost data, factors affecting the maintenance cost, means to be taken to reduce maintenance cost and down time due to maintenance. Guests want rooms that do not have **noise problems, room maintenance problems, HVAC Issues, room smells, insects and other pests, and check-in issues.**

6.0 Self-Assessment Exercise

1. Discuss the response of maintenance staff to repair calls.
2. Enumerate the technical skill requirements for maintenance staff.
3. Explain the major duties and responsibilities of the maintenance staff.
4. Discuss the maintenance battle ground.

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Unit 4 Computerised Maintenance Management Systems (Cmms)

1.0 Introduction

In unit three, we looked at the types of maintenance staff and their response to maintenance requests. We also discussed the standard operating policy for hotel engineering departments and the maintenance battle ground. In this unit, we shall be discussing the goals of Computerised Maintenance Management System (CMMS), its application and general considerations.

Prior to the computer age, paper records were maintained to track the work. Reports were simple but costly to prepare. With the dawn of the computer age it was recognized computer software could be used to record work requirements, track the status of the work and analyze the recorded data for managing the work, produce reports and help control costs. With time computers have become more powerful, less costly, and easier to use and now provide tools to support improved maintenance practices. Facility professionals now have the tools to manage the planning and day-to-day operations and maintenance activities required for a single facility or a large complex, providing all of the information required to manage the work, the work force and the costs and provide management reports and historical data.

2.0 Objectives

At the end of this unit, you should be able to:

- state the goals of Computerised Maintenance Management System (CMMS)
- explain the application of CMMS
- list general considerations and pitfalls in the use of CMMS.

3.0 Main Content

3.1 Goals of Computerised Maintenance Management System (CMMS)

The goal of a maintenance manager is to employ a management system that optimises the use of scarce resources (manpower, equipment, material, and funds) to maintain the facilities and equipment that are the responsibility of the maintenance organisation. The system should provide for integrated processes giving the manager control over the maintenance of all facilities and maintainable equipment from acquisition to disposal. The following list shows what the system should do:

- Address all resources involved
- Maintain maintenance inventory
- Record and maintain work history
- Include work tasks and frequencies
- Accommodate all methods of work accomplishment

- Effectively interface and communicate with related and supporting systems ranging from work generation through work performance and evaluation,
- Support each customer's mission
- Ensure communication with each customer
- Provide feedback information for analysis
- Reduce costs through effective maintenance planning.

A modern CMMS meets these requirements and assists the facilities maintenance manager with work reception, planning, control, performance, evaluation, and reporting. Such a system will also maintain historical information for management use. The manager should evaluate management data requirements and establish electronic data needs prior to acquiring a CMMS or additions to, or replacement of, an existing system. The evaluation should include a return on investment (ROI) analysis before investing in additional or new CMMS capabilities. The manager should only acquire what is necessary to accomplish the maintenance organisation's goals. The following include details of capabilities that may be included in a modern CMMS.

Operating locations
The CMMS may include an application that allows an operator to enter and track locations of equipment (locations in which equipment operates) and organise these locations into logical hierarchies or network systems. Work orders can then be written either against the location itself or against the equipment in the operating location. Using operating locations allows for the tracking of the equipment's lifecycles (history) and provides the capability to track equipment's performance at specific sites.

Equipment
The CMMS may include a module that allows an operator to keep accurate and detailed records of each piece of equipment. This module would include equipment related data, such as bill of material, Preventive Maintenance (PM) schedule, service contracts, safety procedures, measurement points, multiple metres, inspection routes, specification data (name plate), equipment downtime, and related documentation. This equipment data is used for managing day-to-day operations and historical data that can be used to help make cost effective replace or repair decisions. The data can also be used to develop additional management information, such as building equipment downtime failure code hierarchies for use in maintenance management metrics.

Resources
The CMMS may include a separate module to track labour resources. This module typically includes records for all maintenance personnel, including their craft or trade categories, such as mechanic, electrician, or plumber. Additionally, this module may include labour rates in order to capture and track true labour costs against any asset or piece of equipment. Some CMMS will allow maintenance managers to also track skill levels and qualifications for each resource to help in planning and scheduling work. Grouping labour categories into common associations can help a manager assign work to particular shop rather than an individual.

Safety Plans
With the emphasis placed on safety throughout Government and industry a capability for safety plans/planning may be included in a CMMS. The following capabilities should be available:

- Manual or automatic safety plan numbering.
- Building safety plans for special work.
- Track hazards for multiple equipment and locations.
- Associating multiple precautions to a hazard
- Track hazardous materials for multiple equipment and locations
- Once hazards and precautions are entered they should be available for reference and data entry
- Track ratings for health, flammability, reactively, contact, and Material Safety Data Sheets for hazardous materials
- Define lock-out/tag-out procedures
- Define tag identifications for specific equipment and locations
- Define safety plans for multiple equipment or locations
- View and linking documents
- Associate safety plans to job plans, to preventative maintenance masters and to work orders
- Print safety plans automatically on work orders
- Allow tag-out procedures to be associated to hazards or directly to locations, equipment, and safety plans or work orders.

Inventory control
An inventory control module may be included to allow an operator to track inventory movement such as items being moved in or out of inventory, or from one location to another. Stocked, non-stocked, and special order items could be tracked. The module should also have the capability for tracking of item vendors, location of items, item cost information, and the substitute or alternate items that can be used if necessary. Some CMMS recommend and provide the ability to track tools and provide basic tool-room management features as part of the inventory module. This feature will provide work planners the ability to see what tools are in stock and assign tools to various work categories to reduce research effort on the part of mechanics and technicians working in the field.

Work request
A work request module should be an integral part of a CMMS. The module can provide the capability for a request or to input a request, such as a trouble call, or it can be entered by the maintenance organisation's work control. The data entry screen should be designed for minimal data entry. The work order number can be assigned manually or automatically. A requester can enter minimal data and work control can enter additional information as required. Data should be entered once, and pop-up tables in the system should eliminate the need to memorise codes.

Work order tracking
A CMMS must include work order tracking because it is the heart of a work order system. The data should require entry only once, and pop-up tables should eliminate the need to memorise codes. The tracking system should provide instant access to all of the information needed for detailed planning and scheduling, including work plan operations, labour, materials, tools, costs, equipment, blueprints, related documents, and failure analysis. Of course, this is dependent on how many modules are installed and how much information has been entered in the system. The manager must evaluate data requirements and the practicality of adding modules.

Work management
A work management module may be a part of the CMMS. The module could provide the capability that would let a planner specify which labour to apply to specific work orders and when. The module permits planning and dispatching.

Planning: In planning, labour assignments would be planned for future shifts. Each person's availability would be considered when the assignments are made. The assignments would be created sequentially over the shift, filling each person's daily schedule with priority work for the craft. It could even split larger jobs over multiple shifts automatically.

Dispatching: In dispatching, labour assignments would be carried out as soon as possible. This system could begin tracking labour time from the instant the assignment is made. The system operator could interrupt work already in progress in order to reassign labour resources to more crucial work.

Quick reporting
The CMMS could provide a rapid and easy means for opening, reporting on, and closing work orders, and reporting work on small jobs. Labour, materials, failure codes, completion date, and downtime could all be reported.

Preventive maintenance
The following capabilities may be provided in a CMMS to manage a Preventive Maintenance (PM) programme:

- Support multiple criteria for generating PM work orders. If a PM Master has both time-based and meter-based frequency information, the programme should use whichever becomes due first, and then update the other.
- Generate time-based PM work orders based upon last generation or last completion date. Next due date and job plans should be displayed.
- Permit and track PM extensions with adjustments to next due date.
- Trigger meter-based PM by two separate meters.
- Print sequence job plans when wanted.
- Create a PM against an item so new parts have PM automatically generated on purchase.
- Specify the number of days ahead to generate work orders from PM Masters that may not yet have met their frequency criteria.
- Consolidate weekly, monthly, and quarterly job plans on a single master.
- Assign sequence numbers to job plans to tell the system which job plan to use when a PM work order is generated from a PM Master.

- Permit overriding frequency criteria in order to generate PM work orders whenever plant conditions require.
- Route PM with multiple equipment or locations.
- Generate work orders in batch or individually for only the equipment wanted.
- Should have the capability to be used with the system scheduler to forecast resources and budgets.

Utilities
A utilities module may be included that contains detailed information on utilities consumption, distribution, use, metering, allocation to users, and cost. It could include modeling capability and linkage to utility control systems.

Facility/equipment history
A history module may be included that would contain the maintenance histories of the facilities and equipment. It would contain summaries of PM, repairs, rehabilitation, modifications, additions, construction, and other work affecting the configuration or condition of the items. It would include completed and canceled work orders. The maintenance history records can be used to support proactive maintenance techniques such as root-cause failure analysis and reliability engineering.

Purchasing
A mature CMMS may also include a Purchasing module to initiate the requisition of material against a work order and track the delivery and cost data of the item when the material arrives. This capability will allow the maintenance manager improved visibility of matters that can impact work planning and efficiency. Procuring required material outside the CMMS can often leave information gaps that can inhibit the effectiveness of work execution and result in redundant parts orderings and non-standard procurement practices. The purchasing module may include many functions such as a vendor master catalog, invoicing, purchase orders, receiving, and even request for quotations.

Facilities maintenance contracts
A CMMS may contain a contracts module that includes information on maintenance contracts. With other database files, it provides a picture of each contractor's past performance, current loading, and planned work. It could include information on specifications, Government furnished property, quality assurance, payment processing, delivery orders issued, schedules, and related matters. It could cover both contracts for facilities maintenance and support services.

Key performance indicators/metrics
The CMMS can be utilised to accumulate the data for KPIs for use in evaluating the organisation's maintenance programme. The maintenance management organisation must select the metrics to utilise in establishing their goals and to measure progress in meeting those goals. The importance of selecting the Right Key Performance Indicators (KPI) cannot be overstated. The KPIs must be based on data that can be obtained and provide meaningful information that will be utilised in managing the organisation.

Specialised features
Some CMMS providers have also developed specialised capabilities and features for particular business sectors, functions, or requirements. Maintenance managers today can use their CMMS to track transportation and fleet inventory, including maintenance history,

mileages, lease terms, rates, and accounting data. Other managers are using their CMMS to track deployed assets such as computers and other IT equipment. Through their CMMS they track changes, additions, and movement of equipment, including software inventory on PC. When selecting a CMMS; consider the full scope of asset management options, with a focus on consolidated IT solutions.

Application
A Computerised Maintenance Management System (CMMS) can be used to manage simple or complex facilities, from a single building to a complete campus. They can also be used to manage the maintenance programme for a grouping of equipment such as a fleet of vehicles. The systems are very versatile since most are in modular form for the various maintenance functions and can be customised to fit the particular application.

Whatever system or set of modules are selected for use, careful consideration needs to be given to Functional Requirements and a sound deployment plan. The CMMS must meet the needs, constraints, and opportunities of the business and be implemented in a way that users will welcome the technology and have a vision for the benefits it brings.

Proper configuration, testing, and training cannot be over emphasised when bringing a new CMMS or upgrading an existing system to an organisation.

3.3 General Considerations

When considering a Computeried Maintenance Management System (CMMS) there are certain things that must be considered if the system is to be an asset and a usable tool in the managing of the day-to-day maintenance and operations within an organisation. Before procuring and installing a CMMS, consider the following:

- Understand what other systems are in use by your organisation that the CMMS will have to interface such as financial and geospatial systems, and ensure that this interface can be easily managed. Users and managers of these systems should be involved in developing your CMMS, including your IT group.
- When considering a new system, make sure that the data from your existing system can be easily and accurately transferred.

Look for full support from the vendor during installation and testing. Ensure this includes ample training of your staff in the use of the system in both operating the system and how to maximise the benefit of the information within the system. The vendor should leave you with a clear understanding of what it can and cannot do.

3.4 Potential Pitfalls

- Do not go into the selection of a system without a clear definition of requirements in terms of what you expect it to do and how it is to meet your specialised needs. Also, have a clear understanding what metrics you want your CMMS to produce and what the work process is for your organisation. You may want to bring in outside professional guidance that is experienced in CMMS but not associated with any particular vendor or system.
- Do not try to develop a CMMS in-house. You will spend an inordinate amount of time and money designing a system that is likely already available on the market. There are

many vendors of good off-the-shelf systems that have the advantage of years in developing and improving systems for other similar clients.

- Do not make your CMMS your primary payroll and accounting system. Remember it is a work management system that requires data relating to time and costs (thus interfacing with your financial systems) but it should not be the system that employees rely on to get paid, otherwise it will get tied up every two weeks with payroll time entry.
- Do not get locked into a structure that is difficult to enter data and lacks the necessary flexibility to be upgraded or modified. Consider who will be entering the data and their computer skills. The CMMS should have the flexibility to enter data from multiple sources and media. The more ease of data entry will improve its accuracy and the resulting output. Also, the system should be flexible enough to allow the transfer of data during the design and construction phases of a project, e.g. Construction Operations Building Information Exchange (COBIE).
- If you are considering replacing your existing system, do not get locked to "lost costs." Do not fall for the logic that what you have now is not doing the job but you have too much time and money invested in it to change. Consider only the time and cost to correct your existing system to meet your needs versus what a new system would cost.
- Do not limit yourself to looking at only one system early in the selection process. Develop a short list and "road test" each product. Establish rating criteria and score the actual performance of each candidate.
- Do not be the Beta test. Look for systems that have a proven track record with agencies similar to yours. Avoid unneeded complexity.

Self-Assessment Exercise

1. What is CMMS?
2. State some capabilities that may be included in CMMS.

4.0 Conclusion

In this unit, we have looked at the goals expected to be achieved by the application of Computerised Maintenance Management System. We also listed the general considerations before the use of Computerised Maintenance Management System as well as some pitfalls that could be encountered.

5.0 Summary

The goal of a maintenance manager is to employ a management system that optimises the use of scarce resources to maintain the facilities and equipment that are the responsibility of the maintenance organisation. A modern CMMS assists the facilities maintenance manager with work reception, planning, control, performance, evaluation, and reporting. A Computerised Maintenance Management System (CMMS) can be used to manage simple or complex facilities, from a single building to a complete campus. There are several points and various pitfalls to consider before the procurement and installation of Computerised Maintenance Management System.

6.0 Self-Assessment Exercise

1. List five goals of Computerised Maintenance Management System.
2. State the general considerations in the use of Computerised Maintenance Management System.

7.0 References/Further Reading

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