UNIT- V

Material handling equipment

Material handling equipment:

It involves the movement of materials, manually or mechanically within the plant it is a mechanical device for handling of supplies in the greater ease and economy.

The movement may be horizontal, vertical or combination of both. MHE refers to various materials handling equipments like carts, hand trucks, false lifts, conveyers and also not limited to self pictures, motorized pullet jacks, track and other specialized industrial tracks powered by electric motors internal combination engine.

Need for maintenance of material handling equipments:

It eases the usage of manual handling and enhances operational effiency. In today's economic clomate of high labour and capital equipment cost, unexcepted machine failures and malfunctions can seriously and regatively imfact company profits. The breakdown, failure or malfunction of material handling equipment can cost a company time and money material handling maintenance program for MHE will help to maintain the highefficiency and keep it in running contition this also reduce the cost of expensive repairs as a result of a breakdown or unnecessary wear, enhanced productivity due to lease machinery downtime and reduction in the potential for personal injury

Maintenance of material handling equipments

The proper maintenance of material handling equipment is extremely essential for preventing the occurrence of bottle neck or points of congestions production line flow can be maintained only if the material handling equipments is in proper working order. Out of

money maintenance techniques available preventive maintenance is one of the best maintenance techniques suggested in case of material handling equipments.

Preventive maintenance helps to keep the material handling equipments always running conditions there by minimizing the interruption duing operation. A periodic inspection and minor alignments may be adequate to prevent the equipment breakdown. Preventive maintenance also includes lubrication adjustment and repaire.

There are three stages of preventive maintenance and they are

- Inspection
- Repaire and
- Overhaul

Maintenance strategies for hoists and cranes.

Portable cranes:

The major issues covered in maintenance of portable cranes are:

- It is necessary to keep loads within design limits on portable cranes that are mounted on wheels or wheeled platforms
- Frequent inspection of cralus, load hosting and lowering mechanism.
- Inspection of boone, base and platform for any sign of store e.g crachs, bends, breaks.

Overhead cranes:

the major issues covered in maintenance

- Keep the attachment in overhand crane loaded within the rating capacity.
- Maintain safety factors for replacement pasts according to manufactures specifications.
- Check welded connection(e.g main chords and other structural items) for crachs, bends, abrasion and corrosion

stages of preventive maintenance cranes Inspection:

All parts, open or covered are infected for wear and tear, worn out or unworkable components like wire ropes, wheels, hearings, both etc are removed. Breaks are adjusted and necessary lubrication applied.

Repaire:

The repairable parts of the system after inspection are corrected for small repaires and minor refects arre rectified. Systems like open gear transmission, coupling, riveted and lotted joints, trolley, breaks, guareds etc may be repaired according to the needs.

Overhaul:

It involves dismantling the complete mechanism and replacing all damaged components, crane strutive, buffers,rails, open gear transmission pulley blocks, etc may be replaced and various sub mechanism may be aligned and adjusted to ensure smooth operation

Maintenance chategies for conveyors:

The major issues covered in maintenance of conveyors are:

- Conveyor system need to be inspectd on a regular basis. The important areas include edlers, bearings, chains and belts. All of there morning parts are selected to wear and tear.
- check conveyors detect any belt slippage, dragging or defecture welars
- frequently overlooked are conveyor rolters, belts, chains regular maintenance procedure. So proper attension is repaired for the same.
- Moring equipment parts are subjects to blocks caused by metrial fatigre loose bearing and obstractions.
- Checks conveyors regularly to detect any belt slippage dragging a defective rolkers. Control static electricity through

Bonding and grounding to minimizing static charges.

Stages of preventive maintenance for conveyors:

- Inspection:

  Belt or rollers are inspected for tensions, user and tear gear box properly lubricated, various fasteners are lightened and safety guards are checked.

- Repair :

  Rollers and belts are checked adjusted or repaired couplings, packing, safety guards, steal structures, gear transmission, learning joorts, threaded components etc are adjusted or repaired as per their condition and requirements.

- Overhaul:

  The conveyor system is completely dismantled components, wornout and beyond repair item like belts, bearings, packing, oil, sealers, rollers, drancs, fasteners and and coupling are replace

  Structures and safety guards may be repaired as per their conditions.

  L3-A typical scheduled conveyor maintanence plan

  - Check/lutricate all bearings,universal joints and pulleys
  - Check chain tension, wear and lubricate
  - Check sprocket alignment wear and screw set
  - Check flat belt tension, wear and lacing
  - Check v-belt tension wear share alignment
  - Check electrical connections at conveyor

- Check box and fill with lubricant to proper level
- Check general condition of system
- Operate entire system after service
- List any items requiring replacement or repair

Forklipts:

The major issues coraed in maintenance of forklipts are:

- Forklifts require a daily inspection for proper operation. Daily checks should wheels, brakes, forks, chains, hydraulics, steering horn & fuel.
- fork lifts with engine should be checked for coolant and engine oil levels.
- forks are subjected to jolts,atrranion, overloading etc which may reduce the lticleaness of blaks bend or burist them and cause fatigue cracks in areas of high stress concentration. Inspect truchs carefully for signs of excessive were and tear

- remore accumulations of grease dirt
- scheduled maintenance hased on engore hour or motor hour experience may reduce malfunctions.
- Gare special attension to breaks limit switches,trolley wheels, loadd hocks, castes and chairs. These needs to be examined for evidence of wear, malfunction, damage and proper operation.
- Inspect sheares ruts, bolts,clamps, braces, hooks and scrilar parts monthly or more frequently. Depending upon usage

A typical scheduled lift maintenance plan

- Check all safety devices on unit, such as up/down limits,door switches, pressure relief value etc
- Clean all debirs from the pit or from the victrity of floor

mounted units in order to avoid interference with the lift mechanism or rollers.

- Check for presence and proper setting of all snap rings and chips on axles, cylinders and rollers.
- Check rollers,pins and bushings for any signs of wear such as flat spots, missing fasteners,or dislodged bearing material.
- Inspect all welds under and around the left or fatigue or failure particularly inspect thestructural welds
- Check the hydrautic fittings for crachs or leaks and clean up any seepage on or benefit the cylinders.
- Check hoses and electrical limes for astrorions other abuse and check for snug connectors.
- Semi-annualy, change hydraulic fluid in cylinders.
- Check general condition of the lift.operate the lift after service.ched for any abnormal roles or vitrations.
- List any items requiring replacement or repaire.
- In addition to the wheels, the surface on which equipment is operated needs to be respected.
- Rough areas, crachs, pot holes,or brollen concrite are need to be identified and repaired.
- Floor surfaces, when improperly maintained, create problems for all types of material handling equipment in addition to slip, trip and fall hazards.
- These conditions can cause an accident resulting in damage to the material or to the werler operating the equipment.
- The hazards may be controlled by using correct surfacing/cleaning methods and materials.

- Schedule repair for cracks and other damage, repair holes should be carried out immediately

Check jacks:

- Inspect jacks for broken teeth or faulty holding fixlines and remove from service if there are any signs of hydraulic flid leakage, malefactions or other defacts. Test jacks under load conditions after repaire have been made.

Important points in maintenance of MHE:

- Training is the key to safe material handling and the operation of equipment being used to complete the job.
- Training will help to reduce unnecessary damage to equipment and prevent personal injury to employes.
- Selecting the right equipment for the jobs is also important task.
- For example selection of proper fork lifts for work inside a closed warehouse.
- The obrious choice would be an electric fall lift to avoid carton monoside explore from the exhast.
- Another example is selecting a hand truck for rough ground or floor conditions.
- In this case with rough ground or floor conditiona hand trucks with lager preumatic wheels would be the right choice.
- There is no single, complete maintenance program which will fit all your needs.

System approach to maintenance:

- The proper operation of on industry requires appropriate strategies in maintanence management.
- This is ensured by the effective integration of various phases involved in management.
- A good maintenance management can be considered as having six phases as shown in fig 5.1 they are
    - Planning
    - Scheduling
    - Execution
    - Reworking and
    - Analysis

Work identification is done by this methods.

six phases of good maintenance management

Work identification

Work planning

Work scheduling

Work execution

History recording

Analysis

For proper identification and communication of these six phases, system approach to maintenance was developed. The important steps in this system approach are

- Codification and cataloguing
- Preparation of history sheet
- Preparation of instruction & operating manual
- Preparation of maintenance manual
- Maintenance operation liaison
- Maintenance work order permits system.

Computerized maintenance management system (CMMs)

- There is a need to integrate the decision support tools in maintenance function. Support tools in maintenance planning and execution for the efficient discharge of the maintenance function.
- There is an increasing trend in application of information based decision support systems in different departments of modern industry.
- Thus computers have become an indispensable requirement in maintenance management
- Computer is an efficient and reliable tool for maintenance personal to plan and implement their programmers.
- The success of CMMS depends on the quality of integration of computer system in maintenance management.
- Computerized maintenance management system (CMMS) is used

to track all maintenance costs and equipment repairs.

- This tracking is accomplished by the monitoring of work orders.

    - This task will provide necessary information to track and plan and maintenance budgets.

Effective cost control through CMMS is also achieved by the monitoring of purchase and inventory costs. This will track spare part costs and aims to avoid excessive inventories.

This module also helps in vendor selection and monitor the shipping time.

A computerized maintenance management system includes thefollowing aspects:

- Development of a database
- Analysis of available part records
- Development of maintenance schedules
- Availability of maintenance arterials
- Feedback control system
- PEM
- Project management.

COMPUTERIZATION OF MAINTENANCE SYSTEM

Computerization of a maintenance work order system enhances and improves maintenance efficiency if the correct computer system for the installation is used.

The computer maintenance system is more effective if there

is a manual work order system already in fork.

The objective of computerized maintenance system is as follows:

- Maintenance of existing equipment
- Inspection and service of the equipment
- Installation or revamping of the equipment
- Maintenance sharkeeping
- Craft administration

Advantages of computerized maintenance management system

The features in the computerized maintenance management system provide the following advantages to the user:

- Improve maintenance efficiency
- Reduce maintenance asks
- Reduce the equipment downtime by proper scheduling
- Reduce the overtime and ensure optimal utilization of man power
- Increase the lift of equipment
- Provide historical database to assist in maintenance planning and budgeting
- Provide maintenance reports in specific formats depending

on the requirements.

- Quicker access the plant maintenance statistic
- Conformity with health and safety standards

The overall reduction of maintenance costs after the introduction of a computerized maintenance management system in the diagram given fellow

Work identification

Work planning

Work scheduling

Work execution

History recording

Analysis

General structure of computerized maintenance management system

Most computerized maintenance management systems accomplish this objective through the use of four system modules. They are:

- Work order planning and scheduling
- Maintenance store contracts
- Preventive maintenance
- Maintenance reports

Work order planning and scheduling:

Computerized work order are documents that detail maintenance works. The computerized work orders should contain information such as

- Work order
- Details of equipment for which work is requested
- Description of work
- Type of work such as emergency routine, preventive maintenance etc.
- The basis for an effective work order system is the work order number.
- All material and labour works are charged to this number
- Work order must be input into CMMS from a maintenance request from, which is filled is by the industrials requesting the maintenance work once the work order is in the system, the user may work at the work order, update it as it is being worked on, and remove it from the backlog once it has bear completed.

In case of emergencies action being with mental instructions and the paper work follows later, the plant uses the work order form as the document to record information associated with executing the work request.

Work order entry

The general work order entry requires the following information to be filled by the user:

- Equipment number that requires maintenance
- Priority and description of the work
- Estimated cost of work
- Information for dependent or associated work tasks for a complex maintenance jot.

Work order backlog:

The backlog is the storage area for all active work order

Work order system:

The work order system is the information system for the maintenance organization it is an important for an organization to maintain proper records to perform any meaningful analysis on its politicizes and procedures.

The computerized maintenance management system allows computer tracking and analysis of work orders as well as plant equipment data.

General structure of maintenance work order

Maintenance work order:

A Maintenance work order generally gires the following information

- Work order number and code

- Departments address and code.
- Date of issues.
- Detects of approval
- Date of receipt of work order
- Priority
- Location
- Equipment details

Planning and scheduling work orders:

It has four objectives:

- Provide on efficient methods of requesting and assigning work performed by maintenance personal
- Provide an efficient methods of transmitting written instruction on the work to be carried out
- To provide a method of estimating and then recording actual maintenance costs and
- To provide a method of gathering the information necessary to prepare reports for management

crafts:

the correct number of craftsmen may be scheduled so thatwork order is carried out in the most efficient manner.

Materials:

The material module should provide the following information:

- Stock number of required parts
- Quantity required

- Cost per item
- Description of item

CMMS require the following information about the tool:

- Tool ID
- Description of tool
- Quantity required
- Cost of tool(if necessary)

Scheduling:

It contains the list of work order its be performed.
Scheduling module of CMMS contains the following information

- Weekly schedules
- Work order completion
- Work order cost charges
- Labor records

Maintenance store controls

The two primary objective of the store control modules are to

- Monitor material states
- Monitor material resources

CMMS maintenance store module contains the followingInformation to satisfy its objective:

- Store stock material issue states
- List of unplanned materials
- Planned materials
- Stocks return
- Stock item work order reference
- Store catalog- stock number
- Store cycle counts
- Purchase order inquiry
- Purchase order update

Preventive maintenance modules:

This function is used to change orupdate preventive maintenance scheduling information.The preventive maintenance module ofCMMS contains the following information

- user defined specific tasks
- grouping of tasks by crafts
- equipment preventive maintenance entry/update

- preventive maintenance meta recording update
- predictive maintenance

Maintenance reports:

The maintenance reporting function with provide management with the information necessary to operate the maintenance organization at peak efficiency

This report contains the following information

- work order priority analysis
- planner efficiency
- supervisor work order performance
- Still work order performance
- Work order costs report
- Completed work performance this field contain the information about total labour costs, cumulative costs and labour hours by craft
- Work order backlog summary
- Equipment repair history
- Equipment maintenance costs report
- Safety work order backlog
- Stock item usage report
- Work order waiting list
- Preventive maintenance overdue report

JOB CARDS AND JOB CARD PROCEDURES:

Job cards contain necessary detail necessary details for performing indiridual job in maintenance. Job card may be in the form of a card, sheet or paint out

Job card contain the following information:

- equipment code and shop code
- job code
- nature of job & job details
- initiation time
- job start and completion time
- man hours spent
- constraints/duriation

Benefits of Job Card System

The following are the benefits and advantages of job card system

- information about maintenance history
- knowledge of frequency of maintenance for equipments
- details of equipment which require maintenance resources
- help in job auditing

- Evaluation of Costs of Maintenance
- Information about Equipment Downtime
- Estimation of Loss Of Production
- Idea about man power utilization

Equipment records

They are information containing the details of installation service repair, maintenance activities, conditions, defects, schedules and plans for future implementation equipment records are to be used to maintain control on maintenance cost, reliability and availability

Types of equipment records

They are many types of equipment records available in industry catering to various needs. They are as follows:

- planned work and percentage to planned work achieved
- ratio of planned to planned work
- production delays & downtime
- ratio of preventive work to corrective work
- failure patterns
- repetitive breakdown

- manuals including operating manual, instruction manual, maintenance manual, job manual and drawings
- history cards and records
- spall cards
- maintenance requirement records
- performance details
- cost reports
- condition monitoring reports

Advantages of equipment records:

The following are the advantages of equipment records:

- clear picture about the details of maintenance programmers is obtained
- Information about completed, pending and regular jobs carried out to the equipment are available.
- Records discriminated to various units of the industry helps in standardization of procedure.
- Evaluation of performance of maintenance tasks
- Provide detads of frequency of maintenance

requirements for each equipment

- Comparison of time taken for completing the maintenance job with parts records

Maintenance work execution, monitoring and control

A well designed organization should have proper strategies to execute, monitor and control over the various maintenance tasks

Monitoring:

The role of monitoring in maintenance has the following

Advantages:

- Gather information about derivation and delay in execution of maintenance may provide idea about the need to add more resources to complete the maintenance tasks in scheduled time frames
- Communication of the changes in jobs content to the various follow up agencies.
- Provide information about constraints in technical issues and necessary steps can be taken to improve the existing techniques
- Provide a lead to implement technical advancement and methodologies in future to complete the tasks in more efficient manner.

Control:

The system shows the interaction between shop supervisors and maintenance executes. After the constraints of material or resources met, unfinished maintenance tasks will be executed.