

## Unit II

Subject Name	Sub Code	Semester	Prepared by
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### Materials Handling

#### Definition

Material handling is an activity that involves movement of material or products within an organization from one place to another place or the flow of material or products to vehicles or from vehicles. The activities are usually confined within the boundaries of an organization. The movement of material from one organization to another is categorized as transportation work, which is not part of material handling activities.

It is not only about the movement of material. It also involves storage, protection, and control of material while it moves in different departments like a warehouse, production, and manufacturing departments. It is one of the essential tasks for organizations. A poorly handled material become waste before it can be used for production purpose or before it is sent to retail stores.

Material handling can be defined as the science and art involved in receiving, packing, storing, and moving material in any form.

#### Objectives of Materials Handling

##### 1. Reduced cost using a material handling

The first and foremost objective of material handling is lowering the cost of production. Because a large portion of the total production cost is spent on material procurement, storage, and movement. Material is crucial for the production process.

The process of production will halt if the material is not provided in sufficient quantity and on time. Therefore, material handling is given the utmost importance. Companies always look for methods that can be used for the optimized use of material.

##### 2. Reduced waste of material

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An appropriate material handling not only concerns about the movement of material but also takes care of placing orders of the right amount, making the use of the material at the right time, keeping the right amount of inventory, and moving material using better techniques and with caution.

All of this is taken care of to reduce the wastage of material. Moreover, lower wastage for material results in lower costs. As a result of which the profit margin of the organization will increase.

### **3. Improved work condition**

Before the inclusion of technology, all movement and storage works were done manually. Some labors were responsible for performing these tasks. They were responsible for all the loading and unloading work.

Poor results in frequent accidents on-site because of poor work conditions. A proper and well-thought material handling also takes care of people performing the work.

### **4. Enhanced distribution**

Distribution means the delivery of final goods to the retailers and wholesalers. A lot of material gets damaged during transportation because of poor packing and poor storage.

It helps in the reduction of damage to **products** during shipping and handling. In addition to this, it also concerns the storage location of the material. A proper storage location reduced the chances of material gets damaged in the storage house.

### **5. Optimized warehouse capacity**

Warehouse cost also adds to the price of the final product. Warehouse capacity means the ability for storing goods. It is essential to take care of the layout of the warehouse, flooring of the warehouse, and aisle space in the warehouse to have optimized warehouse capacity.

### **6. Improved flow of material**

A smooth flow of material is when material enters the company in raw material form at the time when it is required and exits the organization in the form of final goods. The flow of material gets disturbed when the material is not available when it is needed for the production or gets damaged rather than being used for the production process.

It concerns with the smooth flow of material in the organization. It improves the circulation of material in the organization as a result of which material stays for less time in the warehouse and is used for production at earliest.

### **7. Full equipment utilization**

Expensive machinery and equipment are used for the production process. These equipment fails to perform at their maximum capacity because of poor material handling.

Because the performance of these equipment depends mainly on the speed at which the material is supplied and received. Therefore, material handling also helps in the full utilization of the capacity of the equipment.

### **8. Workers' safety**

The last but not least objective is the safety of workers. Poor material handling can result in accidents in the factory, which are very risky for workers working there.

## **Principles of Materials Handling**

### **PLANNING PRINCIPLE**

All material handling should be the result of a deliberate plan where the needs, performance objectives and functional specification of the proposed methods are completely defined at the outset.

### **STANDARDIZATION PRINCIPLE**

Material handling methods, equipment, controls and software should be standardized within the limits of achieving overall performance objectives and without sacrificing needed flexibility , modularity and throughput.anticipation of changing future requirements Definition: Standardization means less variety and customization in the methods and equipment employed.

### **WORK PRINCIPLE**

Material handling work should be minimized without sacrificing productivity or the level of service required of the operation. Definition: The measure of work is material handling flow (volume, weight or count per unit of time) multiplied by the distance moved

### **ERGONOMIC PRINCIPLE**

Human capabilities and limitations must be recognized and respected in the design of material handling tasks and equipment to ensure safe and effective operations. Definition: Ergonomics is the science that seeks to adapt work or working conditions to suit the abilities of the worker.

### **UNIT LOAD PRINCIPLE**

Unit loads shall be appropriately sized and configured in a way which achieves the material flow and inventory objectives at each stage in the supply chain. Definition: A unit load is one that can be stored or moved as a single entity at one time, such as a pallet, container or tote, regardless of the number of individual items that make up the load.

### **SPACE UTILIZATION PRINCIPLE**

Effective and efficient use must be made of all available space. Definition: Space in material handling is three dimensional and therefore is counted as cubic space.

### **SYSTEM PRINCIPLE**

Material movement and storage activities should be fully integrated to form a coordinated, operational system which spans receiving, inspection, storage, production, assembly, packaging, unitizing, order selection, shipping, transportation and the handling of returns. Definition: A system is a collection of interacting and/or interdependent entities that form a unified whole.

### **AUTOMATION PRINCIPLE**

Material handling operations should be mechanized and/or automated where feasible to improve operational efficiency, increase responsiveness, improve consistency and predictability.

### **ENVIRONMENTAL PRINCIPLE**

Environmental impact and energy consumption should be considered as criteria when designing or selecting alternative equipment and material handling systems. Definition: Environmental consciousness stems from a desire not to waste natural resources and to predict and eliminate the possible negative effects of our daily actions on the environment.

### **Meaning of Work Study:**

Work study is the investigation, by means of a consistent system of the work done in an organization in order to attain the best utilisation of resources i.e. Materials, Machines, Men and Money. All the technologies and management systems are related with productivity.

### **Aims:**

To analyse the work in order to achieve work simplification and thereby improving productivity of the system.

(ii) To have optimum utilization of resources i.e., 4 Ms.

(iii) To evaluate the work content through work measurement.

**In Industries work study is considered as a tool of improving productivity by way of:**

- (i) Resource utilization to a satisfactory level.
- (ii) Capital investment to introduce latest technology.
- (iii) Better management of the system.
- (iv) To set time standards for various jobs.

Work study involves lot of changes in various working methods. Since the manpower in general does not like changes but prefers to continue as already doing, so there will always be a tendency to resist any modification or new method suggested by work study people (officers/workers) and the manpower and the workers have confidence in the ability, integrity and fair-mindedness of work study man, there is a good chance that sound proposals will be accepted willingly by the manpower.

**Work study is most valuable tool of management because:**

- (i) It is a direct means of improving productivity of the system involving very less or no cost.
- (ii) The approach is simple, systematic, consistent and based on handling of facts. Thus the part played by opinions in taking decisions is minimized.
- (iii) No factor affecting the efficiency of operation is overlooked in this approach.
- (iv) It provides most accurate means of setting standards of performance which are helpful in the process of production planning and control.

**Work Measurement**

Work Measurement Study is a general term used to describe the systematic application of industrial engineering techniques to establish the work content and time it should take to complete a task or series of tasks.

Work measurement is a productivity improvement tool. Before improvements can be made, the current productivity level of an organization must be measured. This measurement is then used as a baseline to determine if improvement projects have resulted in genuine improvement.

Work measurement helps to uncover non-value added areas of waste, inconsistency, and non-standardization that exist in the workplace. Work measurement studies uncover ways to make work easier, and to produce products or services more quickly and economically.

Work is measured for four reasons:

1. To discover and eliminate lost or ineffective time.
2. To establish standard times for performance measurement.
3. To measure performance against realistic expectations.

4. To set operating goals and objectives.

Work measurement involves the use of engineered labor standards to measure and control the amount of time required to perform a specific task or tasks. While labor standards are most commonly associated with manufacturing or production environments, standards are used in many other types of settings including, but not limited to:

- service or administrative,
- warehousing and distribution,
- retail
- sanitorial,
- medical and utilities.

### **Work Measurement Techniques**

Under the work measurement umbrella there are a number of techniques for collecting the information necessary to develop engineered labor standards.

**Time Study** is the most widely used work measurement technique that employs a decimal minute stopwatch to record and determine the time required by a qualified and well-trained person working at a normal pace to do a specific task under specified conditions. The result of the time study is the time that a person suited to the job and fully trained in the specified method will need to perform the job if they work at a normal or standard pace.

**Predetermined Time Systems** are a technique of motion study and time standards development. The motions of the work or task performed are recorded. Each basic motion has a time value associated with it. Once all the motions for the task have been recorded, the time values are totaled and the standard time for the operation is developed.

**Standard Time Data (Standard Data)** is a generic term given to a collection of time values. Standard data uses work elements from time studies or other work measurement sources making it unnecessary to restudy work elements that have been timed adequately in the past. These element times are extracted from studies and applied to jobs or tasks with the same element(s).

**Work Sampling** is a random sampling technique (statistical sampling theory) that involves observing the worker(s) at randomly selected times and recording the type of activity that is observed at that instance. Work sampling is most commonly used to collect information for allowance calculation, to determine the distribution of work activities, and to determine the productive and non-productive utilization of workers.

## **Time Study**

Time study is a method of measuring work for recording the times of performing a certain specific task or its elements carried out under specified conditions. An operator does same operation (task) throughout the day. Time study help to define how much time is necessary for an operator to carry out the task at a defined rate of performance.

Time study is also called work measurement. It is essential for both planning and control of operations.

### **Steps in Making Time Study:**

Stop watch time is the basic technique for determining accurate time standards. They are economical for repetitive type of work. Steps in taking the time study are:

1. Select the work to be studied.
2. Obtain and record all the information available about the job, the operator and the working conditions likely to affect the time study work.
3. Breakdown the operation into elements. An element is a instinct part of a specified activity composed of one or more fundamental motions selected for convenience of observation and timing.
4. Measure the time by means of a stop watch taken by the operator to perform each element of the operation. Either continuous method or snap back method of timing could be used.
5. At the same time, assess the operators effective speed of work relative to the observer's concept of 'normal' speed. This is called performance rating.
6. Adjust the observed time by rating factor to obtain normal time for each element

Normal= (Observed time \*Rating)/100

## **Maintenance**

**Maintenance** on **plant** and equipment is carried out to prevent problems arising, to put faults right, and to ensure equipment is working effectively. **Maintenance** may be part of a planned programme or may have to be carried out at short notice after a breakdown.

### **Objective of Maintenance**

The objective of **plant maintenance** is to achieve minimum breakdown and to keep the **plant** in good working condition at the lowest possible cost. Machines and other facilities should be kept in such a condition which permits them to be used at their optimum (profit making) capacity without any interruption or hindrance.

- (i) The objective of plant maintenance is to achieve minimum breakdown and to keep the plant in good working condition at the lowest possible cost.
- (ii) Machines and other facilities should be kept in such a condition which permits them to be used at their optimum (profit making) capacity without any interruption or hindrance.
- (iii) Maintenance division of the factory ensures the availability of the machines, buildings and services required by other sections of the factory for the performance of their functions at optimum return on investment whether this investment be in material, machinery or personnel.

#### **Importance of Plant Maintenance:**

- (i) The importance of plant maintenance varies with the type of plant and its production.
- (ii) Equipment breakdown leads to an inevitable loss of production.
  - a. If a piece of equipment goes out of order in a flow production factory, the whole line will soon come to a halt. Other production lines may also stop unless the initial fault is cleared.
  - b. This results in an immediate loss in productivity and a diminution of several thousand rupees per hour of output.
- (iii) An un-properly maintained or neglected plant will sooner or later require expensive and frequent repairs, because with the passage of time all machines or other facilities (such as transportation facilities), buildings, etc., wear out and need to be maintained to function properly.
- (iv) Plant maintenance plays a prominent role in production management because plant breakdown creates problems such as:
  - a. Loss in production time.
  - b. Rescheduling of production.

#### **Types of Plant Maintenance:**

**Maintenance may be classified into following categories:**

- (a) Corrective or breakdown maintenance,
- (b) Scheduled maintenance,
- (c) Preventive maintenance

##### **(a) Corrective or Breakdown Maintenance:**

Corrective or breakdown maintenance implies that repairs are made after the equipment is out of order and it cannot perform its normal function any longer, e.g., an electric motor will not start, a belt is broken, etc. Under such conditions, production department calls on the maintenance



department to rectify the defect. The maintenance department checks into the difficulty and makes the necessary repairs. After removing the fault, maintenance engineers do not attend the equipment again until another failure or breakdown occurs.

**This type of maintenance may be quite justified in small factories which:**

- (i) Are indifferent to the benefits of scheduling;
- (ii) Do not feel a financial justification for scheduling techniques; and
- (iii) Get seldom (temporary or permanent) demand in excess of normal operating capacity.

In many factories make-and-mend is the rule rather than the exception. Breakdown maintenance practice is economical for those (non-critical) equipment whose down-time and repair costs are less this way than with any other type of maintenance. Breakdown type of maintenance involves little administrative work, few records and a comparative small staff.

**Typical Causes of Equipment Breakdown:**

- (i) Failure to replace worn out parts.
- (ii) Lack of lubrication.
- (iii) Neglected cooling system.
- (iv) Indifference towards minor faults.
- (v) External factors (such as too low or too high line voltage, wrong fuel, etc.)
- (vi) Indifference towards -equipment vibrations, unusual sounds coming out of the rotating machinery, equipment getting too much heated up, etc.

**Disadvantages of Breakdown Maintenance:**

- (i) Breakdowns generally occur at inopportune times. This leads to poor, hurried maintenance and excessive delays in production.
- (ii) Reduction of output.
- (iii) Faster plant deterioration.
- (iv) Increased chances of accidents and less safety to both workers and machines.
- (v) More spoilt material
- (vi) Direct loss of profit
- vii) Breakdown Maintenance practice cannot be maintained for those items which are regulated by statutory provisions

**b. Scheduled Maintenance:** Scheduled maintenance is a stitch-in-time procedure aimed at avoiding breakdowns. Breakdowns can be dangerous to life and as far as possible should be

minimized. Scheduled maintenance practice incorporates (in it), inspection, lubrication, repair and overhaul of certain equipment which if neglected can result in breakdown.

Inspection, lubrication, servicing, etc., of this equipment are included in the predetermined schedule. Scheduled maintenance practice is generally followed for overhauling of machines, cleaning of water and other tanks, white-washing of buildings, etc.

**(c) Preventive Maintenance:**

A system of scheduled, planned or preventive maintenance tries to minimize the problems of breakdown maintenance. It is a stitch-in-time procedure. It locates weak spots (such as bearing surfaces, parts under excessive vibrations, etc.) in all equipment, provides them regular inspection and minor repairs thereby reducing the danger of unanticipated breakdown. The underlying principle of preventive maintenance is that prevention is better than cure.

**Preventive Maintenance (or PM) Involves:**

(a) Periodic inspection of equipment and machinery to uncover conditions that lead to production breakdown and harmful depreciation.

(b) Upkeep of plant equipment to correct such conditions while they are still in a minor stage.

Preventive maintenance is practised to some extent in about 75% of all manufacturing companies, but every preventive maintenance programme is tailored as per the requirements of each company. The key to all good preventive maintenance programmes, however, is inspection. Help can be taken of suitable statistical techniques in order to find how often to inspect.

**The Contents in this E-Material has been taken from the text and reference book as given in the syllabus.**