

Material Handling

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→ MH is one of the important aspects to be considered whenever we construct our manufacturing plant. MH should be easy, convenient and cost effective.

MH means providing the right amount of right material in the right condition at the right place at the right time in the right position and for the right cost by using the right method.

→ It is simply picking up, moving and lying down of materials through manufacture.

→ It applies to the movement of raw materials, parts in process, finished goods, packing materials and disposal of scraps.

In general, hundreds and thousands of tons of materials are handled daily requiring the use of large amount of manpower while the movement of materials takes place from one area to another or from one department to another department of the plant.

→ MH is the movement and storage of material at the lowest possible cost through the use of proper method and equipment.

→ MH embraces all the basic operations involved in the movement of bulk, packaged and individual products in a semi-solid or solid ~~solid~~ state by means of machinery and within limits of a place of business.

→ MH is the art and science of moving, storing, protecting and controlling materials.

→ MH is the preparation, placing and positioning the materials to facilitate their movement or storage.

Objectives of Material Handling.

→ The primary objective of a MH systems is to reduce the unit cost of production. The other subordinate objectives are:

- Reduce the manufacturing cycle time
- Reduces the delays and damage (proper handling of material ^{and effective.} ~~not effective~~ ^{reduces damage.})
- ~~prop~~ promote safety and working conditions (overhead cranes)
- Maintain and improve product quality (Ex: conveyor)
 - (Ex: MH in a conveyor) → while transporting using a conveyor if the materials are not ~~prop~~ properly placed or transported it affects the quality of products during at dispatch.
- Promotes ^{enhances / increases} productivity
 - * Material should flow in a straight line
 - * " " " " more as short distance possible
 - * Use of gravity (no additional source of power required)
 - * Move more material at one time (lowers time, cost, energy + power)
 - * Automate material handling.
- promote increased use of facilities
 - * promote the use of building cube
 - * purchase versatile equipment
 - * develop a preventive maintenance program (to avoid frequent breakdowns)
 - * Maximize the equipment utilization etc.

Costs associated with MH

Objective - to minimize cost of MH

Principles of MH

Factors to be considered for MH

- Material → Form (gas, liquid, semi-solid, solid)
- Characteristics (chemical, electrical, mechanical)
- Quantity (pieces, pounds, kilograms, gallons etc)
- Nature (bulk, unit load, individual items, fragile, sturdy, bulked)

Mode - source and destination - receiving, stock room, warehouses, same floor, other floor, other department

Route - location, range, path, cross traffic

Distance - horizontal, vertical, inclined

Frequency - intermittent, uniform, regular, irregular, unpredictable

Speed

Methods

Unit or load - bulk, items, containers

Manpower - one, several, many, none

Equipment - conveyor, forklift trucks, crane etc

Automated MH Systems

Limitations.

- Additional investment (expensive / cost)
- Lack of flexibility. (one automated system cannot be used for other activities)
- Vulnerability to downtime whenever there is breakdown
- Additional maintenance staff and cost
- Cost of auxiliary equipment
- Space and other ~~requirements~~ requirements

Plant Maintenance

- One equipment is designed, fabricated, and installed, the operational availability of the same is looked after by the maintenance department.
- In earlier days, a machine was used as long as it worked. When it stopped working, it was either repaired/serviced or discarded.
- The high cost sophisticated machines, the development of mechanization and automation of production system and associated equipment, ~~as~~ accompanying ~~the~~ ancillary services and safety requirements has compelled Engineers to think about proper maintenance of equipment/machines.
- Maintenance function also involves looking into the safety aspects of certain equipments where failure of components may cause a major accident.
Ex: a poorly maintained pressure vessel such as a steam boiler may cause a serious accident.
- Maintenance work enhances the equipment performance level and its availability is optimum working condition but adds to its running cost.
- The objective of maintenance work should be to strike a balance between the availability and overall running cost.
- The responsibility of the maintenance function should, therefore be to ensure that the production equipment/facilities are available for use for maximum time at minimum cost over a stipulated time period such that the minimum standard of performance and safety of personal and machines is not sacrificed.
- Nowadays, separate departments are formed in industrial organizations to look after the maintenance requirement of equipments and machines.

Maintenance

- helps / leads to prolong the life of equipment
- ensures a good working environment
- helps to achieve production target smoothly and efficiently
- ensure safety

$$\frac{1}{10} \times 100 = 10$$

$$\frac{7}{10} \times 100 = 70$$

$$\frac{2}{10} \times 100 = 20$$

~~$$2x_1 + 3x_2 = 8$$~~
~~$$2x_2 + 5x_3 = 10$$~~

$$2x_2 + 5x_3 = 10$$

$$3x_1 + 2x_2 + 4x_3 = 15$$

$$-3x_1 + x_3 = -5$$

$$3x_1 - x_3 = 5$$

$$2x_1 + 3x_2 = 8$$

$$3x_1 + 2x_2 + 4x_3 = 15$$

$$-x_1 + x_2 + 4x_3 = 7$$

$$x_1 + x_2 + 4x_3 = 7$$

$$-3x_1 - x_3 = 5$$

~~$$-2x_1 + 5x_2 = 2$$~~
~~$$2x_1 + 3x_2 = 8$$~~
~~$$3x_1 + x_3 = 5$$~~