

MATERIAL HANDLING AND MATERIAL STORAGE SYSTEM

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Abstract--The material handling system ensures the timely delivery of desired quantity of material at desired location with minimum cost and maximum safety. Material handling is not a manufacturing process but involve substantial amount of product cost and labor. Due to daily invention of new technologies material-handling equipment are under going continuous automation. Wide ranges of material handling equipment are available in the market and it is difficult to select best one for industries requirement. A material handling system should be chosen in such away so that to reduce manufacturing cost and avoid interruption and damage. On the other side right selection and planning of MH improves productivity, efficiency and profit of a company. This paper focuses on the classification of material handling systems. The challenges in selecting material handling systems are discussed. In this paper an attempt is made to set some guidelines for selecting the best material handling system for a particular task out of available ones.

I. INTRODUCTION

Material handling (MH) involves short-distance movement that usually takes place within the confines of a building such as a plant or a warehouse and between a building and a transportation agency [2-5]. Material handling has often been used as the science of moving, packaging, and storing of substances in any form. However, in recent years, material handling accounts for 35% of all employees, 45% of all factory space, and 80-90% of production time [4-9]. It can be used to create time and place utility through the handling, storage, and control of material, as distinct from manufacturing (i.e., fabrication and assembly operations). Material handling costs 50-90 percent of the total production cost depending upon type of industry [1,7]. It is often said that MH only adds to the cost of a product and not to the value of a product. Although MH does not provide a product with form utility, the time and place utility, provided by MH can add real value to a product, i.e., the value of a product can increase after MH has taken place. The value added by having parts stored next to a bottleneck machine is the savings associated with the increase in machine utilization minus the cost of storing the parts at the machine [14]. That is unfortunate because there is much more to material handling than the method employed. Further more, in some applications the best method of handling material may not require equipment [10]. In recent years, there has been a tremendous growth of material handling technology and equipment types; robots, automated guided vehicles, high-rise storage retrieval systems, computerized picking systems, and computer controlled conveyor systems. Material handling systems have been accepted as an integral part of today's manufacturing systems and are increasingly playing an important part in the productivity of the plant [12-14]. However, with the wide range of material handling equipment available today determination of the best equipment alternative for a given production scenario is not an easy task [11].

A number of researchers define different criterion to select the MH equipment for a particular task. The few had applied analytic methods for selecting the required MH equipment under a specific handling task. Most important factors were decided which may vary from task to task in the MH equipment selection. A few proposed the methods with the help of computer aided technologies to draw the motion trajectories and find out path interferences to fulfill multiple purpose objectives. Different models were developed to locate machines and find out interference to avoid the bottleneck. This paper focuses on classifying the material handling equipments and provides the guidelines to select best of the available ones for a particular task.

II. TYPES OF MATERIAL HANDLING SYSTEMS

The most common material handling equipment types have been introduced by this work in the following areas:

- Transport material handling systems
- Positioning Material Handling Systems
- Storage Material Handling Systems

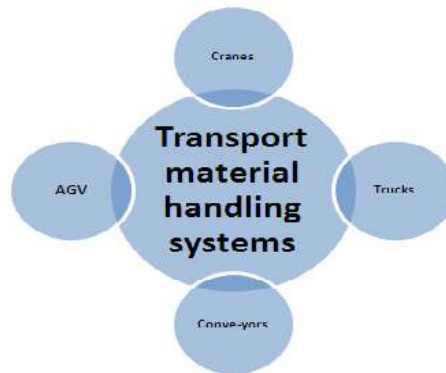


Figure 1: Types of transport material handling systems

2.1 Transport material handling systems

Transport material handling systems are used to move material for a short or long distance from one location to another like between workshops, between cities, to store, to railway, to ships. The major subcategories of transport material handling systems are given in Figure 1. In addition to manual system, conveyors (like flat belt, trolley), cranes (like gib, gantry), trucks (like light, heavy) and automatic guided vehicles (AGVs and robots) can be used to shift the material. The few images of transport material handling systems are shown in Figure 2.



(a)



(b)



(c)



(d)

Figure 2: Types of transport material handling systems (a) conveyors (b) cranes (c) trucks and (d) AGV

2.2. Positioning Material Handling Systems Positioning material handling systems are used to shift materials to very nearby places like used for storage, pick and place etc. Positioning tools frequently handle the material in a small bounded area. Various equipments like lifts, rope or chain hoist, pick and place robots etc. can be used as position monitoring MH systems, see Figure 3. Important aspect of such systems is to ensure positional accuracy, without which these systems are meaningless.



(a)



(b)



2.3 Storage Material Handling Systems

Equipment used for holding, transferring or storing materials over a period of time. Some storage equipment may include the transport of materials, see Figure 4.



Figure 4: Types of storage material handling systems

III. GUIDELINES FOR SELECTION OF MATERIAL HANDLING EQUIPMENT

Although, no selection principles are available till date, however, following guidelines may be adopted while selecting a MH system.

- a) Define objective and specifications
- b) Plan the process of handling with reference to available resources of MH in the market
- c) Design shortest and less time consuming material flow lines
- d) Take care of worker's capabilities and limitations
- e) Ensure safety of human being
- f) Limit the package size with reference to floor area
- g) Use maximum vertically space for material handling
- h) Avoid bottlenecks
- i) Use automated material handling systems
- j) Select energy efficient and environment friendly MH equipment
- k) Must be economical and easily operated
- l) Low maintenance
- m) Keep manual system ready along with MH systems

Apart from above guide lines, the type of material to be handled also affects the packaging and handling system a lot. The physical state i.e. solid, liquid and gas, size i.e. dimensions, weight, shape and other characteristics like oily, brittle, humid, volatile, temperature also play an important role in selecting a MH system.

V. CONCLUSION

From the above study it has been analyzed that observed that the material handling is an important task in the industry and involves a lot of total product cost. The selection of the most appropriate MH equipment for any particular application is very important and affects productivity and efficiency of an industry. Types of material handling systems are outlined and discussed. Transportation, position and storage material handling equipment are discussed briefly with the few examples. Further some guidelines are provided to select the best material handling equipment for a particular task. Thus the paper concludes that selection of material handling equipment plays an important role increasing productivity and efficiency of the industry and ensures safety of labor and quality of product.

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