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Design and Fabrication of Weight Operated Material Handling System

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Abstract - *Material handling is main operation in industry. Material handling involves transfer of jobs from one machine station to another storage and packaging. Weight operated material handling device has large load carrying capacity, less or no maintenance. This project is basically weight operated material handling device. This device has more reliability. This material handling equipment paper is not only based on for material handling, it is not required external power i.e., electrical, it totally operate and depends on weight of material or job. Industrial material handling device are operating on electrical power but this device does not required electricity, it is operating on weight of job.This project develops the problem of different types of material handling equipment in a typical material handling system. Spring operated material handling equipment has large load carrying capacity, easy maintenance and high reliability of operation. Material handling equipment is the media of transportation of material from one point to another in a commercial point or space.*

Key words— material handling1, less cost2, free energy, 3 less maintains4.

1. INTRODUCTION

Material handling is process of movement of job or material from one place to another place i.e. from one machine to another store room to machine shop or from machine shop to store. In many industries material handling is automated but it requires more electricity and it is main contribution of price of the product. Some small-scale industries material handling is manually material handling is risk full or harm full to workers or manpower. This may lead to back pain or muscular pain. This material handling device eliminates the manual material for short distance between two machine stations. These material handling devices also reduce the pries of the product by minimizing material handling cost. These also reduce the cost of power. In this device potential energy of the job is used to transfer of the job. Nowadays, major, medium as well as small local automotive manufacturing industries are experiencing rapid development in concept of technology and system applied, resulted by stronger domestic and global market demands. As the companies grow, the need for efficient material handling system also arises especially in the manufacturing area.

Material handling system is one of the basic components that complement the whole manufacturing operation. Material handling system basically refers to any equipment, activities and procedures related to the moving, storing, controlling and protecting of materials flow in a manufacturing system. It provides the manufacturing system with smooth material flow without excess inline and outline inventory. The material handling system is categorized as non-value added (NVA) activities which implying that the less material handling involved is the better. However it is impossible to totally eliminate the material handling activities in any manufacturing operation. Hence an efficient and effective material handling system is always the ultimate objective by many companies. Material handling operations involve raw material movements, subassemblies; work in process (WIP), tools, finished products, and other support materials from one point to another in the plant. Basically material handling equipment is used to the picking an object from one place and travel to it and place at another location without much power of man wasting.

A material handling equipment is separated into four main parts :-
1) Storage and handling equipment,
2) Engineered systems
3) Industrial trucks,
4) Bulk material handling.

According to industrial review the power or electricity which has been utilized for production out of which 32 to 35% of power is only utilized for material handling during the product ion which is unnecessarily wasted and hence the total value of final product will increase. So, if we want to decrease

the total value as well as the unnecessary electricity consumption either we have to reduce material handling or try for alternative handling like that this concept. As the first option has several limitations we are trying for alternative handling system like that weight operated material handling equipment.

2. LITRATURE REVIEW

A. Overview of Material Handling:

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.‖1 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), which creates ―form utility‖ by changing the shape, form, and makeup of material. It is often said that MH only adds to the cost of a product, it does not add 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;
for example:

• The value (to the customer) added by the overnight delivery of a package (e.g., Federal Express) is greater than or equal to the additional cost of the service as compared to regular mail service—otherwise regular mail would have been used.
• 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.

B. Design of MH Systems:

A common approach to the design of MH systems (MHSs) is to consider MH as a cost to be minimized. This approach may be the most appropriate in many situations because, while MH can add real value to a product, it is usually difficult to identify and quantify the benefits associated with MH; it is much easier to identify and quantify the costs of MH (e.g., the cost of MH equipment, the cost of indirect MH labor, etc.). Once the design of a production process (exclusive of MH considerations) is completed, alternate MHS designs are generated, each of which satisfies the MH requirements of the production process. The least cost MHS design is then selected. The appropriateness of the use of MHS cost as the sole criterion to select a MHS design depends on the degree to which the other aspects of the production process are able to be changed. If a completely new facility and production process is being designed, then the total cost of production is the most appropriate criterion to use in selecting a MHS—the lowest cost MHS may not result in the lowest total cost of production. If it is too costly to even consider changing the basic layout of a facility and the production process, then MHS cost is the only criterion that need be considered. In practice, it is difficult to consider all of the components of total production cost simultaneously, even if a new facility and production process is being designed. Aspects of the design that have the largest impact on total cost are at some point fixed and become constraints with respect to the remaining aspects of the design.

C. Principles of Material Handling:

Although there are no definite ―rules‖ that can be followed when designing an effective MHS, the following ―Ten Principles of Material Handling,‖3 as compiled by the College-Industry Council on Material Handling Education (CIC-MHE) in cooperation with the Material Handling Institute (MHI), represent the distillation of many years of accumulated experience and knowledge of many practitioners and students of material handling:

• **Planning Principle.**
All MH 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.**
MH methods, equipment, controls and software should be standardized within the limits of achieving overall performance objectives and without sacrificing needed flexibility, modularity, and throughput.
• **Work Principle.**
MH work (defined as material flow multiplied by the distance moved) should be minimized without sacrificing productivity or the level of service required of the operation
• **Ergonomic Principle**
Human capabilities and limitations must be recognized and respected in the design of MH tasks and equipment to ensure safe and effective operations.
• **Unit Load Principle.**
Unit loads shall be appropriately sized and configured in a way that achieves the material flow

and inventory objectives at each stage in the supply chain.

• Space Utilization Principle.

Effective and efficient use must be made of all available (cubic) space.

• Automation Principle.

MH operations should be mechanized and/or automated where feasible to improve operational efficiency, increase responsiveness, improve consistency and predictability, decrease operating costs, and to eliminate repetitive or potentially unsafe manual labor.

• Life Cycle Cost Principle.

A thorough economic analysis should account for the entire life cycle of all MHE and resulting systems.

3. Problem Statement:

The normal material handling systems & conveyor assembly normally involves the use of channels, rollers and shaft that are heavy by virtue of their structure and the material used as steel also they will have operated on power sources. There is continuous power consumption. To overcome this problem, we can use weight & spring-operated material handling system.

4. Objectives: ,

1) To make use of mechanical material handling devices to reduce manual work.

2) To ensure safe, effective and flexible material handling.

3) To arrange material and material handling devices in a manner, not to disturb the production activities.

4) To make use of gravity forces for material movement, wherever possible.

5) To use the principle of containerization, unit load or palletization and move optimum number of pieces at a time.

5. Work methodology to solve the problem:

Step 1:- Identification of problem: In day-to-day life electrical energy have evolved as one of the most basic needs of human being. We know that for the material handling we need to more human effort and need of more electrical energy. Today we required material handling equipment should be cheap and challenge to safe. To reduce material handling cost so we choose material handling equipment for our project work.

Step 2:- Literature Survey: Various studies have been made in different industries to indicate that the cost of handling alone accounts for about 20-25% for the total manufacturing cost.

Step 3:- Design of Mechanical Part: This phase involves the design of various elements such as spring, shaft & gear.

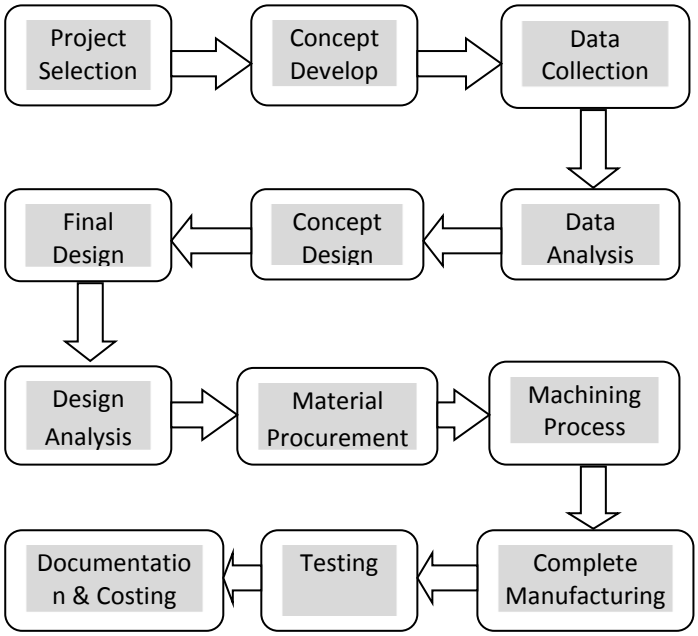
Step 4:- Software Modeling: Detailed drawing using AUTO-cad software, creo software ANSYS software. Designed part is drawing using AUTO-cad.

Step 5:- Fabrication: All the designed elements are manufactured in the workshop such as frame, shaft as per design and also select the part as per specification for e.g. rack and pinion, support rod chain and sprocket etc. Upper frame, lower frame, cross bar are manufacturing in workshop

Step 6:- Assembly: All the manufactured and selected parts are assembled together. The assembly of the equipment is in two steps

1. Assembly of main frame with Rack & Pinion.
2. Assembly between main frame and cross bar tension mechanics.

6. Process flow chart:



7. Design of the Model

8. ADVANTAGES& LIMITATIONS

8.1. Advantages:

1) It can handle the job without any power consumption at packaging& machining destination with prepared time limits.
2) Machine work on the no power consumption.
3) It increases the safety and working condition.
4) Only simple support structures are required
Design & fabrication is easy.
5) It is a faster material handling process.
6) Initial investment is low.
7) More accurate and economical in mass production Packaging.
8) It minimizes misalignment & less floor space is required.

8.2. Limitations:

1) This material handling system can perform a motion only within design length maximum 4-5 feet.
2) This material handling system is required precise alignment of all moving parts to perform more rigid & smooth operation.
3) If any transmission losses & misalignment in system, it will affect the distance travel.

9. CONCLUSION

We conclude that we completed project named Material handling equipment It works on the self-weight of job object which has to be transfer from one place to another place without using electricity or fuel. By using this system we save energy as well as save cost Material handling equipment is the media of transportation of material from one point to another in a commercial point or space. Industrial material handling device are operate on electrical power but this device does not required electricity, it is operate on weight of job. Hence we are satisfied with our work.

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