Design and Development of Material Handling Equipment: A Review

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Abstract: Material-handling system can be defined as movement, handling, storage and controlling of materials throughout the manufacturing process. The main purpose of using a material handling system is to ensure that the material in the right amount is carefully delivered to the desired destination at the right time at minimum cost. Helical compression springs are generally used to absorb the energy due to the impacts and to form a flexible link which deflects under loading and restore the objects to the normal position where the disturbing forces are removed.

Keywords: Helical Spring, Rack & Pinion, Chain drive

Introduction

Material handling system evolves movement of material, machine from one place to another. It is technique used to deliver the right goods safely, to the right place and time and at the right cost. Combining the handling process means carryout other value adding processes such as Inspection, painting, cleaning while material is moving.

A good material handling system seems to achieve the profitable product because about 80% of total cost of product is evolved in movement of material and only 20% of cost is involved in carrying out actual processing of product. Various material handling Equipments should be well installed and mentioned for smooth and continuous flow of material.

Activity of material handling equipment before implementation first carry its criteria, specific industry match the particular product.

Conventional Methods

In conventional method material is transferred by trolley, tray, Pallets, Lift, trucks, roller conveyers, portable hand hoist, pulley. In this type of equipment it requires extra helper (manpower) more efforts and time consuming with risk of damage of material and health. After development it is done by AGV, robots, cranes, elevators, trackless truck, power assisted hoists. Therefore traditional method of plantation is time consuming as well as it is expensive.

Methodology

In order to achieve design considerations, according to proposed design and requirement one would follow a qualitative approach. The main objective of this project is to design the helical spring, chain drive and rack-pinion as per the proposed design. After this work complete the literature review about material handling equipment, chain drive and rack-pinion. An attempt has been made to the problems that are coming into account during its functioning. After then complete selection of component like sprocket, base wheel, frame etc. Then complete the manufacturing and fabrication of corresponding component. After then complete testing on the basis of trial and error.

Literature review

Ghazi Abu Taher et. al. [1] In this paper author says belt conveyor has huge load carrying capacity, large covering area simplified design, easy maintenance and high reliability of operation. During the project design stage for the transport of raw materials or finished products, the choice of the method must favor the most cost effective solution for the volume of material moved; the plant and its maintenance; its flexibility for adaptation and its ability to carry a variety of loads and even be overloaded at times. A bucket elevator or conveyer is a mechanism for hauling flow able bulk materials by following an assembly line in horizontal, vertical or inclined direction. The difficulties mainly arise when it is necessary to convey a bulk material through a linear distance as well as a certain height. Efficiency & accuracy of the system were ensured using the
sensor. Project is based on the handling of bulk material and its packaging process. A weight sensor is attached with the microcontroller which helps to package the bulk material at proper amount. A bucket elevator consists of a series of uniformly fed buckets mounted on an endless chain or belt which operates over head and foot wheels. The material is received at the boot, raised and then discharged by passing over the head wheel at the top, into a discharge chute. A conveyor belt consists of two or more pulleys, with a continuous loop of material - the conveyor belt - that rotates about them. Conveyors are durable and reliable components used in automated distribution and warehousing.

Satbeer Singh Bhatia et. al [2] Author told in this paper helical compression springs are generally used to absorb the energy due to the impacts and to form a flexible link which deflects under loading and restore the objects to the normal position where the disturbing forces are removed.

Abhilasha Dongre et. al. [3] In this paper a material-handling system can be defined as movement, handling, storage and controlling of materials throughout the manufacturing process. The main purpose of using a material handling system is to ensure that the material in the right amount is carefully delivered to the desired destination at the right time at minimum cost. Material handling as such is not a production process and hence does not add to the value of the product but it costs 30-75% of the total product cost. An efficiently designed material handling system ensures the reduction in operation cost, manufacturing cycle time, MH cost, delay and damage.

Sangmesh Pattar et. al. [4] This paper highlights a spring is a flexible element used to exert a force or a torque and, at the same time, to store the energy. The spring which is considered in the paper is a part of automobile horn, where the horn is used for maintaining safe distance and it is subjected to varying load. The spring is analyzed through analytical and finite element method to check the variation in the deformation value as well as maximum shear stress value.

Nilesh Bodkhe et. al. [5] From these paper main object of research behind the conventional method of material handling equipment they have also gives some kind of ide a replacing conventional method by pneumatic system .pneumatic conveying system depend on mass flow rate. Material and air mixed and conveyed through pipeline loop .some situated number of bends provided for flexibility. Researcher has observed structures of pneumatic conveying system are induction circuit, pressure circuit, closed circuit. Component of feeding hopper, prime mover, blower, conveyor system venturimeter.

Kumbhar P.M. et. al. [6] From this paper researcher told about various material equipment which based on the operation mainly discussed with foundry .they have also carried material system classified on material orientation method orientation .function orientation .they also gives material handling system important principal like as planning, space, ergonomics, ecology, unit load, economy, standardization, safety , gravity, layout, etc. also gives classification of equipment based on product like as conveyer crane, wheel, bracket.

Surinder Kumar et. al. [7] Material handling technology is becoming the most important criteria to all type of the productive and non-productive businesses operating in today’s competitive society. So material handling equipment selection is an important function of a material handling system. Use of proper material handling equipment can enhance the production process, and improves system flexibility. Material handling equipment plays an important role in the design and development of advance manufacturing systems (AMS) like flexible manufacturing systems. Material handling equipments affects the performance and productivity of these advance manufacturing systems. So it becomes very important to select a right kind of equipment while designing the high end manufacturing systems like FMS. In this paper an attempt has been made to select the most appropriate material handling equipment for the design and development of FMS.

Chetan P. Chaudhari et. al. [8] In this paper author is explain about bearing is a machine element which supports another moving machine element (known as journal). It permits a relative motion between the contact order to reduce frictional resistance and wear and in some cases to carry away the heat generated, a layer of fluid may be provided. The lubricant used to separate the journal and bearing is usually a mineral oil refined from petroleum, but vegetable oils, silicon oils, greases etc., may be used. Bearings can be split into two groups: Rolling bearings and Sliding bearings. Rolling bearings attempt to eliminate friction and sliding between surfaces in a junction by introducing interfaces such as balls or rollers which rotate or roll in as opposed to sliding.

Abhijeet R. Maske et. al. [9] Material handling devices which have operated by spring have high load carrying capacity, compact design and ease in maintenance. Also for this equipment no need external power for working. According to industrial review the power which has been utilized for production out of which 32 to 35% of power is only utilized for material handling during the production which is unnecessarily wasted and hence the total cost of final product will increases. So if we want to decrease the total cost as well as the unnecessary power consumption either we have to reduce material handling or try for alternative handling. From the problem for the material handling we need more human effort and need of more electrical energy author get this solution of spring operated
material handling equipment. Dr. Devanand Uttam et. al. [10] Art and science of conveying, elevating, positioning, transporting, packaging and storing of materials starting from the time enters the mill gate and goes out of the mill gate in the form of finished products. It has been estimated that average material handling cost is roughly 10-30% of the total production cost depending upon product to process. Material handling involves the movement of materials, manually or mechanically in batches or one item at a time within the plant. To choose most appropriate material handling equipment which is safe and can fulfill material handling requirements at the minimum possible overall cost this is function of material handling section. Most important aspects for analyzing or solving a material handling problem are: engineering aspect, and economic aspect.

Conclusion

By using this material handling system we can transfer material from one place to another place without external power. This material handling equipment can save time, money and labor cost. The cost of this material handling equipment is comparatively less. So it is suitable for small as well larger scale industries.

References


