

Design and Analysis of Heavy Load Lifting Mechanism

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ABSTRACT

In today's modern Workers still handle the loading and unloading of cement bags in the local market. The health of the workers is at stake while using this method to load and unload cement sacks. As a result, a cement bag loading/unloading machine that can meet market demand must be designed and built. With the aid of standard model calculations, this research offers the design of the conveyor system used to load and unload cement bags. This includes the selection of the gear box, shaft diameter, pulley, motor, belt specification, speed, and width of the belt. This device will save time, cut costs, and lessen health and safety concerns for employees.

INTRODUCTION

In the earlier days of lifting and sack handling units, the process of lifting sack from one place was very difficult all the work done was manually which was leading to human efforts and due to hooks which was damaging the sack where the powder was falling down and damaging the bag and material. In other words there were number of labours engaged in the process.

The process of developing a new product that consumers must approve of is known as product design. It is crucial in a broad sense. the process of developing ideas into a new product in an efficient and successful manner. Product designers will analyze and develop concepts in a methodical manner, transforming them into real inventions and finished goods.

The job of the product designer is to fuse technology, science, and the arts to produce new goods that people can use. To check the losses of cement on floor, it is needed to measure the amount of falling cement to the ground during lifting and moving. The primary goal in planning and building this project was to minimize the amount of labour required by humans

and the amount of time needed for fitting and movement.

LITERATURE SURVEY

1. **Austin Hughes' "Electric Motors and Drives":** The comprehensive guide "Fundamentals, Types, and Applications" examines electric motors from a variety of perspectives. Primarily, it explores the essential principles that underpin the operation of electric motors, giving readers a firm grasp of ideas including electromagnetism, motor design, and fundamental operating principles.

In addition, the book goes into great detail about the several kinds of electric motors that are on the market, including synchronous motors, induction motors, DC motors, AC motors, and more. To help readers understand the wide range of possibilities available for various purposes, each kind is likely to be covered in detail along with its special qualities, benefits, and limits.

Furthermore, the work emphasizes the useful uses of electric motors, showing how these devices are applied in a variety of industries, including robotics, HVAC systems, manufacturing, and transportation. By examining case studies and real-world examples, readers can learn about the importance and adaptability of electric motors in contemporary technologies and procedures.

2. **"Irving M. Gottlieb's "Electric Motors and Control Techniques"** is a noteworthy advancement in the field of control techniques for electric motors. This book, which was released in February 1994 by McGraw-Hill Education, is well known for its thorough examination of sophisticated control techniques

meant to maximize motor performance in a variety of contexts.

This resource's emphasis on control strategies beyond the fundamental ideas presented in introductory texts is one of its noteworthy features. It is probable that Gottlieb explores more complex control techniques including sensor less control, vector control, and field-oriented control, which are necessary to achieve accurate and productive motor performance in hard industrial settings.

Furthermore, it is anticipated that the book will offer thorough explanations of the signal processing methods, feedback mechanisms, and control algorithms used in motor control systems. Precise explanations of subjects such as pulse-width modulation (PWM), proportional-integral-derivative (PID) control, and adaptive control are to be expected; they will provide readers with an understanding of the theoretical underpinnings and real-world applications of these methods.

3. **"Link belt- screw conveyor and feeder"** by the material handling division of FMC Corporation is a specialist magazine that provides an in-depth examination of the screw conveyor and feeder systems that the firm manufactures. This document, which comes from the material handling business of FMC Corporation, is a great tool for anyone who works with screw conveyors and feeders or other material handling equipment in terms of design, operation, and maintenance.

This publication's emphasis on offering comprehensive specifications for Link-Belt screw conveyors and feeders is one of its main characteristics. It is anticipated that readers will find extensive details about the specifications, construction materials, capabilities, and other technical aspects pertaining to these particular kinds of equipment. This makes it possible for procurement specialists, plant managers, and engineers to choose or specify screw conveyor and feeder systems for their applications with knowledge.

4. **"Material Handling Equipment"** by Stephen and Adamson is projected to be an all-inclusive resource offering a wide-ranging summary of material handling machinery, with an emphasis on conveyor systems. This publication, written by subject-matter specialists, is expected to address a wide range of issues pertaining to the

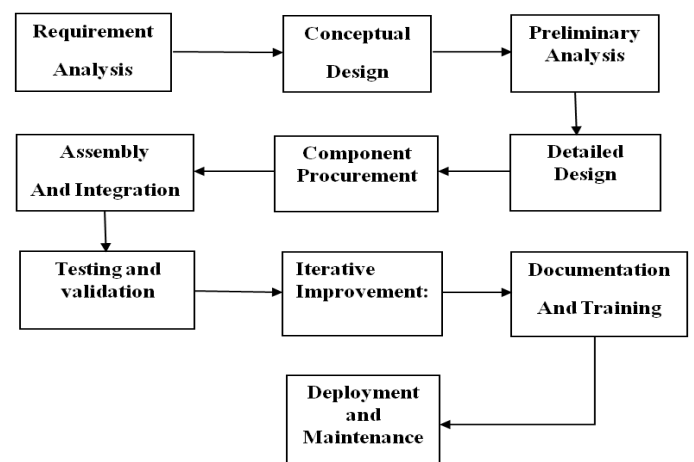
layout, choice, use, and upkeep of material handling machinery in industrial environments. This publication's examination of several kinds of material handling equipment outside of conveyor systems is one of its most important features. Expect in-depth discussions on a variety of equipment, including automated guided vehicles (AGVs), forklifts, palletizers, cranes, and hoists. The text helps readers grasp the variety of options available for effectively moving, storing, and managing goods in industrial situations by offering insights into the features and functions of various types of equipment.

Considering their extensive use and significance in material handling applications, conveyor systems are probably going to be discussed in-depth in the text. Discussions on various conveyor system types, such as belt, roller, screw, and overhead conveyors, among others, should be expected from readers. The design principles that underpin these systems may be covered in detail in the book, taking into account things like material properties, throughput demands, layout restrictions, and safety considerations.

OBJECTIVES

- This project's primary goal is to pick the heavy load from stacking position in warehouses and to keep it on moving conveyor belt or other place.
- To reduce the human efforts
- To build a product which can be obtain in very less price
- Taking safety as prime consideration, this device must be safer in all respects.
- To improve productivity

PROPOSED METHODOLOGY



1. Requirement Analysis:

- Identify the lifting capacity, dimensions, and environmental conditions.

2. Conceptual Design:

- Brainstorm and generate initial concepts for the lifting mechanism.

3. Preliminary Analysis:

- Conduct initial feasibility studies, considering factors like material strength, power requirements, and safety.

4. Detailed Design:

- Develop detailed engineering drawings and specifications for components and assemblies.

5. Component Procurement:

- Source or manufacture necessary components, considering quality and compatibility.

6. Assembly and Integration:

- Assemble components according to design specifications, ensuring proper alignment and functionality.

7. Testing and Validation:

- Conduct rigorous testing to ensure the lifting mechanism meets performance and safety standards.

8. Iterative Improvement:

- Analyze test results and user feedback to identify areas for improvement, and iterate on the design accordingly.

- 9. Documentation and Training:** - Document the design, assembly, and operation procedures for future reference, and provide training for operators

- 10. Deployment and Maintenance:** - Deploy the lifting mechanism in its intended environment, and establish a maintenance schedule to ensure continued performance and safety.

WORKING

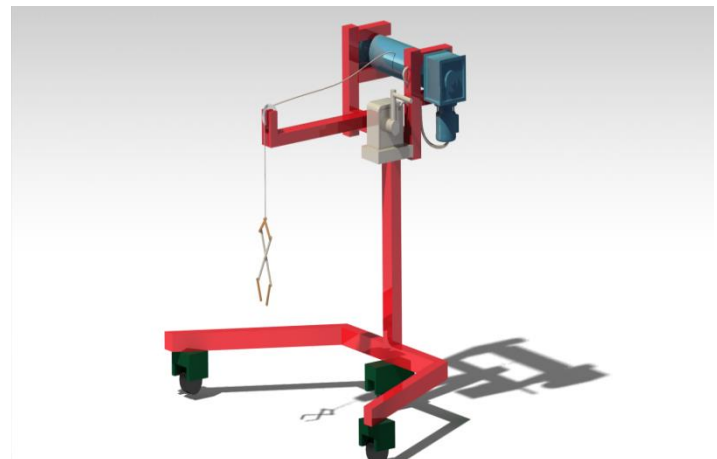
As we have defined in the problem statement this a major problem for lifting the sacks which will makes holes in the bag which leads to damage the bags and material start falling down so to be able to overcome we have designed this machine we have made the simple mechanism in which we have to used a motor that is

fastened to the roller to which the bearing support is given and then the wire rope is attached which will roll on the roller and leading to lift the bag as we have used a gripper with scissor a system that will lift the bag without damaging the bag and then we can move the trolley any where we required the mechanism is very simple.

PROBLEM IDENTIFICATION

1. Generally, the workers carry the cement bag on their back during loading and unloading which is not a proper way to handle the cement bag this Causes health problem sometimes.
2. When workers handle the cement bags during loading and unloading they use the hooks for uplift the bag which will cut the bag and material will fall down
3. Because of hook used during loading and unloading time there are 8 holes created9. Documentation and Training: - Document the design, assembly, and operation procedures for future reference, and provide training for operators.

DESIGN



General Requirements of Machine Design

1. High productivity.
2. Ability to produce and provide required accuracy of shape and size and also necessary surface finish.
3. Simplicity of design.
4. Safety and convenience of control
5. Low Cost.
6. Good Appearance.

Design procedure for a product

A designer may work in the following ways when creating a new product or its components:

1. Provide a thorough description of the issues, being as specific as you can, along with the reason the machine has to be built.
2. Choose the potential mechanism that will provide the desired motion.
3. Ascertain the forces at work on it and the energy that each machine component transmits.
4. Choose the material that fits each machine component the best.
5. Calculate the permissible or design stress while taking into account every element influencing the machine part's strength.
6. Determine the machine's significance, necessity, and intended use.
7. Issues with the productivity and demand of the machines as they are now
8. Determine the size of each element with a view to prevent undue distortion or breakage under the applied load.
9. Modify the machine element or parts to agree with the past experience and judgment and to facilitate manufacture.
10. Create assembly and detailed machine drawings that include all material and production procedure specifications, such as surface polish and accuracy.

SELECTION OF MATERIALS

Square and rectangular pipes are extensively used in welded steel frames which experience heavy loads from multiple directions. The shape of pipes suit multiple axis loading with having uniform geometry along with two or more cross section axes. This enhances the uniform strength of these pipes, making them better choice of columns. These are manufactured through the process where flat steel plate is slowly changed in shape to achieve round where the edges are presented to weld. Then the edges are welded together to form the master tube. This master tube which is also referred as mother tube goes through a sequence of shaping stands, which form the final square or rectangular shape.

The square sections enhance the reliability of the structure. These are manufactured using graded steel in compliance with set international standards. The square sections are used as support in automotive industry, transmission tower plants, machinery industry, construction industry and many others. These sections are made using high grade steel metal in compliance with international standards. The square section holds superb tensile strength and is rust resistant with ability to offer long working life. The sections are tested on various parameters, which are tensile, bending, flattening and other strengths.



Features of the tube

- Supreme resistance to torsion.
- High impact strength
- Corrosion resistant
- Easier to transport.
- Good weld ability.
- Supreme tensile strength.
- Dimensional accuracy.

Applications

- Construction industry.
- Machinery manufacturing industry.
- Storage system
- Transmission towers
- Automotive industry.

COMPONANTS

- 1) Tube
- 2) Motor
- 3) Wire rope
- 4) Bearing
- 5) roller
- 6) Castrol wheels
- 7) Wire
- 8) switch
- 9) Fasteners
- 10) gripper



ADVANTAGES

- Simple, effective design and construction.
- Very economical and easily affordable at a reasonable cost.
- Easy to operate.
- Easy installation.
- Un-installable when not in use.
- Economic regarding power consumptions.
- Compact size, easy for parking.
- The kit is ecofriendly.

APPLICATIONS

- Lifting cement bags
- To lift the pipes
- To lift fertilizers
- Adaptable in ration shops
- Adaptable in go downs

FUTURE SCOPE OF THE PROJECT

We believe that the project we completed has a good potential for growth in any Although this gadget has low operational expenses, its expensive upfront cost is its primary limitation.

This gadget can be a terrific ally in any industry that deals with corroded and unused metals, and the savings it generates from use will allow it to pay for itself quickly. The device offers a great deal of room for customization, additional advancements, and operational effectiveness, which should make it appealing and commercially viable.

We are confident that it will be accepted in the industry if it is produced commercially and appropriately marketed.

FINISHED MODEL



- 6) "Material handling equipment" by Stephen and Adamson.
- 7) "Material handling hand book" by American society for mechanical engineering.
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- 9) www.howstuffworks.com/screw-conveyor/working.html
- 10) www.wikipedia.com/Screw-conveyor/types.html
- 11) www.airconindia.org/material_handling_systems.html

CONCLUSION

We have taken up this project as real challenge, as we were not experience in the field. We started our work on this project facing new hurdles initially.

The manoeuvrability of the device is quite good and the handling is quite simple. By making the device larger, one can effectively increase its efficiency for commercial purposes.

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REFERANCE

- 1) Austin Hughes 'Electric Motors and Drives: Fundamentals, Types and Applications'
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- 3) J B Gupta & P S Bimbhra 'Electrical Machines' Khanna Publishers, 2003
- 4) "Thomas Conveyor Company" pdf.
- 5) "Link belt- screw conveyor and feeder" byFMC corporation –material handling division.