Review of Designing a Material Handling System at Mahalakshmi Dhatu, M.I.D.C, Hingna, Nagpur

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Abstract— the concept of material handling is based on the handling, movement, controlling and storage of materials. The relation of materials handling in the region of engineering and technology is used with reference to industrial activity. In any industry materials have to be handled from the spot of receipt and storage of raw materials, through production processes and up to finished goods storage and dispatch points. This research is based on the necessity of Mahalakshmi Dhatu industry. During a visit to the industry, it was revealed that there is a need of designing a semi-automated material handling system. So we will design a CAD model of the machine and then analyze it. This paper contains data accumulation, literature review, plan of work for the project.

Key words: Material Handling, Automated Material Handling

I. INTRODUCTION

Material Handling involves short-distance movement within the confines of a building and a transportation vehicle. It utilizes a wide range of manual, semi-automated, and automated equipment and includes consideration of the protection, storage, and control of material throughout their manufacturing, warehousing, distribution, and disposal. There are two types of material handling.

- Manual Handling- Manual handling refers to the use of a workers hands to move individual items by lifting, lowering, filling, emptying, or carrying them.
- Automated Handling- Whenever technically and economically feasible, equipment can be used to reduce and sometimes replace the need to manually handle material.

Fig. 1: Example: Overhead Crane used in Material Handling

II. LITERATURE REVIEW

A. *Kuyama Shuji, Tomiyama Shinji*

In recent years, the steel manufacturing process has become more complex as a result of the trends toward higher grades and greater diversity in steel products in response to customers' needs. As there is also a heightened need for shorter delivery dates, logistics scheduling and production planning have also assumed greater importance than in the past. Logistics in a steel works is not simply a matter of transporting finished products and intermediate products from the previous process to the following process in accordance with the delivery schedule; it also has the role of rearranging the order of products in the production schedule in the following process in advance so as to enable smooth transportation to the following process. For this reason, establishing efficient logistics schedules are a challenging task. On the other hand, accompanying recent increases in computer capacity, optimization technologies have been widely applied to logistics scheduling.

B. *Pratik R. Patel, V.K.Patel*

A crane is mechanical equipment for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine. A crane with a single or multiple girder movable bridge, carrying a movable trolley or fixed hoisting mechanism, and traveling on an overhead fixed runway structure is known as overhead crane. Material handling is a vital component of any manufacturing and distribution system and the material handling industry is consequently active, dynamic, and competitive. Material handling is an important practical consideration in the design of new manufacturing and distribution systems and research into better material handling systems and practices is important. Material handling uses different equipment and mechanisms called Material handling equipment. Main component of overhead crane is girder beam which transfers load to its structural member. In the early stage, there was few software available used Finite Element Analysis (FEA) technique. In present, Structural analysis of girder can be done by different software using Finite Element Analysis (FEA) technique.

C. *Abhilasha Dongre, Prof. N.Y.Mohite*

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. It promotes productivity, flexibility, better utilization of manpower, increases material flow and automation in handling. This paper discusses the research carried out on material handling system design, MH equipment Selection, Analysis and simulation from last decades to get the best solution for implementing the design of MH system in the existing facilities. The constraints and challenges in designing material handling system, solutions are identified and discussed.

D. Kaustubh V. Wankhade and Dr. N. A. Wankhade

Material handling task (of handling molten metal) in casting industries is very difficult and risky one. At present this task carried out manually for small-scale castings and with the help of ladle attached to the overhead crane hook for medium and large-scale castings. Now a day this operation required at least two workers in both cases, and aim of this research paper is to minimize labour requirement for handling and pouring molten metal and with less risk. This paper reviews the design, modelling and computer simulation as a tool for aiding trolley used by various researchers earlier. The results of computer simulations and results obtained by real experimentation compared to get detailed idea about the design ideas. Design and analysis carried out with various CAD software like CREO PARAMETRIC or CATIA and ANSYS. Researchers have done tremendous work in the area of trolley design with greater reliability, protection and robust design also design was adequate and costs reduced. Speed of trolley can increased by increasing gearbox speed and reducing failures in gearbox.

E. Girishkumar Nagnath Jagdale, Rajratna A. Bhalerao, Dhanajay K. Patel

This paper deals with the design and development of mechanical device to lift v engine of 300 kg and put at different locations in the manufacturing plant with safety and economic considerations. Three models are designed in CATIA and analyzed in ANSYS with different loading conditions and finalized one for manufacturing and testing with actual load. Hoisting operations cause the serious hazard to both trained and untrained workers. Every year many workers, across the world are killed or injured while operating with this type of equipment's. The basic cause behind that they do not recognize the dangers associated with equipment and particular task to be performed. Health and safety is the most important issue and it should be considered same conventionally the engine is tackled with the flexible belts and hook arrangement, but it has many disadvantages which overcome all the benefits from it. This paper gives the five suitable models for the lifting tackle for the V Engine with safety, reliability, compatibility, economic considerations. These systems are analyzed by using analysis software, for the selecting the optimal solution of problem.

F. Gunter Sharp, Yen-Tai Wan, Leon F. McGinnis

The problem of selecting and specifying material handling systems for manufacturing operations is challenging because of the variety of technologies available for material handling tasks and the significant fixed costs of systems. Most of the previous work in this area usually does not address the possibility of selecting from among different technology types, such as forklift truck and AGVS. This paper presents a four-step approach to the problem, consisting of task extraction, filtering tasks and matching them with resources, task aggregation, and system selection. The goal of this research is to develop an approach to material handling system selection and specification that satisfies the following three characteristics: (a) it is a bottom-up approach that uses manufacturing data such as facility layout and parts routing, (b) it is fast enough so that a system designer can evaluate different options with respect to grouping material handling tasks and technologies, and (c) it can be used for both design of new plants and evaluation of existing plants in the face of changing production requirements. The problem is important because material handling costs account for a major part of manufacturing costs, and material handling systems impact production scheduling flexibility.

G. F.T.S. Chan

A key task in the material handling system design process is the selection and configuration of equipment for material transport and storage in a facility. Material handling equipment selection is a complex, tedious task. However, there are few tools other than checklists to assist engineers in the selection of appropriate, cost-effective material handling equipment. This paper describes the development of an intelligent material handling equipment selection system called MHESA (Material Handling Equipment Selection Advisor). The MHESA is composed of three modules: a database to store equipment types with their specifications; a knowledge-based expert system for assisting material handling equipment selection; and an analytic hierarchy process (AHP) model to choose the most favorable equipment type.

III. DATA ACCUMULATION

Image of area where material handling system needs to be designed at Mahalaxmi Dhatu

Fig. 2: Image of area where material handling system needs to be designed at Mahalaxmi Dhatu

- Total lengthof the area: 115 Meters
- Total widthof the area: 25 Meters
- Total arear to be covered under material handling system: 2875SQ.Meters
- Maximum weight of one stack: 4000 Kgs
- Minimum length of one stack: 10 Meters
- Mode of operation: Semi automated
- Number of labor: 6

- Time taken to load one truck: 45 minutes

IV. PROBLEM STATEMENT

- During a visit to the MAHALAXMI DHATU it was revealed that there is a need of designing a semi-automated material handling system.
- The current material handling system used for loading and unloading of the various materials require a lot of manual handling.
- At MAHALAXMI DHATU various types and sizes of steel channels are manufactured. These channels are very heavy and usually require two cranes to carry them from one place to another which is quite dangerous for the men working around the loading area.
- In this project, the design of a material handling system which will help in increasing the safety of the workers, the working efficiency and saving the time and efforts of the workers will be designed with the help of CAD and FEA software's.
- With this project the company will be benefited from the advancements of computer technologies.

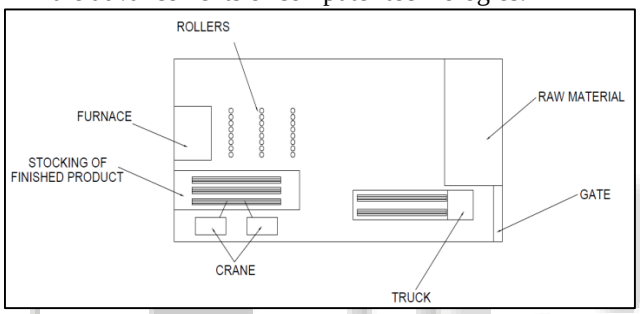

Fig. 3: Line Diagram of the Current Material Handling System Being Used

V. PLAN OF WORK

- Data accumulation
- Literature survey
- Design calculation of Material handling system.
- CAD modeling of the Material handling system.
- Analysis of design in FEA.
- Modification of the design if needed.
- Analysis of modified design in FEA.
- Result discussion
- Design finalization
- Conclusion

VI. CONCLUSIONS

- The Industry Mahalaxmi Dhatu, will be benefited from the advancements of computer aided design technologies after a successful completion of this project and thus will be able to increase production with the help of material handling system.

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