International Journal of Research in Engineering, Science and Management
Volume-2, Issue-2, February-2019
www.ijresm.com | ISSN (Online): 2581-5792

Ergonomic and Technical Aspect in Redesign of Material Handling System

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***Abstract*: This paper presents an overview on Improvement activities of the axle industry in half line assembly which include Material handling system, Productivity improvement and Setup time reduction**

***Keywords*: Material Handling System**

1. Introduction

The contemporary research in selection problem of material handling equipment (MHE) has started publishing three decades ago. The problem with a set of data with methodology to be developed. Implementation of MHE is all about getting the right product to the right place at the right time to the right person for the least cost. Material handling system provides transportation and storage of materials, components and assemblies. Material handling activities start with unloading of goods from delivery transportation, the goods then passed into storage, machining, assembly, testing, storage, packaging, and finally loading onto transport. Each of these stages of the process requires a slightly different design of handling equipment's.

There are two major functions of material handling section:

1. To select production machinery and assist in plant layout so as to eliminate as far as possible the need of material handling.
2. To choose most appropriate material handling equipment which is safe and can fulfill material handling requirements at the minimum possible overall cost.

The average material handling cost is estimated roughly 30 % of the total production cost depending upon product to process. By reducing the material handling, cost of production can be reduced considerably.

2. Literature review

Paper title: Automation of Material Handling with Bucket Elevator and Belt Conveyor", Author: Ghazi Abu Taher et. al.

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.

Paper title: Significance of Selection of Material Handling System Design in Industry, Author: Abhilasha Dhongre et. al.

In this paper a material-handling system can be defined as movement, handling, storage 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.

Paper title: Experimental and finite element analysis of hydroforming process for stepped die, Author: Sangmesh Pattar et. al.

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 maintain safe distance and it is subjected to varying load. The spring is analyzed through analytical and finite element method to check

Table 1
Cycle time for each operation before implementation of supply kit trolly, Total cycle time (in minutes)

Assembly Parts	Kitting time	Transportation time	Halt time	Minimum time	Maximum time	Total time
	35	10	30	75	80	80

Table 2
Part Components and Quantity requirements

Part Component Name	Part Number	Requirement Quantities in Numbers
Washer	1229-E-1513	16
Washer thrust	1229-Z-3094	4
Diff Pinion	2233-W-153	4
Diff case half	3235-E-C057	2
Spider	3278-V-1088	1
Locknut	NL-27-1	8
Cap Screw	S-2726-2	8

the variation in the deformation value as well as maximum shear stress value.

Paper title: Design, analysis & fabrication of Pneumatic material handling system, Author: Nilesh Bodkhe et. al.

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 had observed structures of pneumatic conveying system are induction circuit, pressure circuit, closed circuit. Component of feeding hopper, prime mover, blower, conveyer system venturi meter.

3. Statement of company's problem

A detailed study of the assembly line has been made and various inputs for improvements and suggestions are tabulated. The problems identified in the company are described below.

1. Previous to this time, assembly of parts in half line was 50 to 55 per shift due to increase in demand the company suggest preparing a supply trolley kit for the assembly to quench the current demand and parts was mass dumped.
2. The materials stored is away from the required area and insufficient material handling equipment.
3. Lack of space at loading bays and Shortage of manpower.

Fig. 1. Kitting trolley before implementation

Fig. 2. Initial situation before implementation of supply kit

It is observed in half line assembly station, actual Cycle Time is of 80 min. The operator used 12.5% for walking (transportation time) and 43.75% for kitting i.e. placing the components in the trolley from the Cycle Time.

4. Objective of company requirement

Reducing walking distance between the two departments by placing the parts and components nearest to the point of use of the operators so that they can use both hands at the same time.

Designing the trolley that could carry 2X times the components with respect to initial condition and can be placed at the same time. Heavy weight textile components to be placed at the bottom of the trolley so that in order to achieve a good amount of center of gravity. The process of storage will be with a suitable degree of inclination.

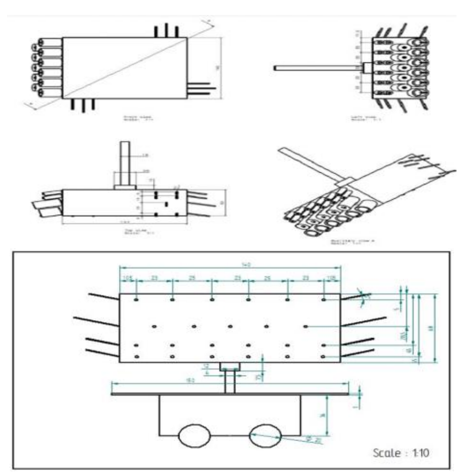

Fig. 3. Inter axle assembly supply kit trolley 2d view

Table 3
Number of Components accommodated per Face of the cube

Row Numbers	Component	Number of Rods Provided in each Face	Number of components in Each Rod	Quantity in terms of Numbers
R1	Ring	6	6	36
R2	Spider	3	6	18
R3	Diff-pinion Gear	6	6	36
R4	Diff-pinion Gear	6	6	36

Table 4
Cycle time for each operation after implementation of supply kit trolly, Total cycle time (in minutes)

Assembly Parts	Kitting time	Transportation time	Halt time	Minimum time	Maximum time	Total time
	15	4	10	30	40	40

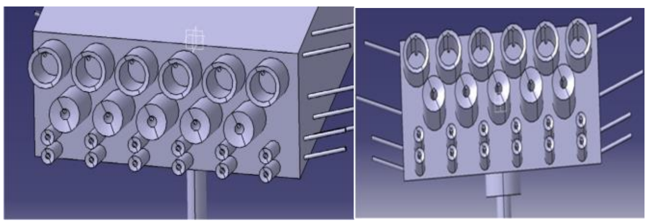

Fig. 4. Inter axle assembly supply kit trolley 3d model

Number of assemblies per shift = 70
Material Handling Equipment Geometric shape = Cube
Number of assemblies that can be made per face = 18
Total number of assemblies that can be made by 4 faces = 72

5. Results

Through approximate time study, new improved supply kit for workstations are calculated and summarized as in table 4.

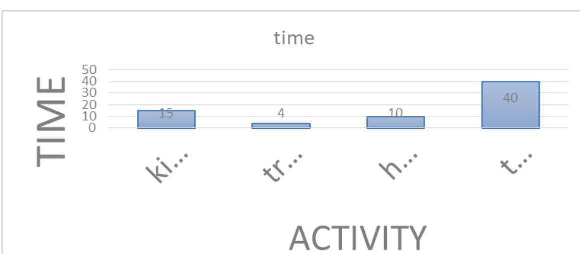

Fig. 5. Final stage after implementation of supply kit

It is observed that the actual Cycle Time of workstation is now 40 minutes with 50% reduction. This is as a result of the reduction of transportation by 2.5% and 6.25% in kitting for assembly station.

6. Conclusion

This paper concludes that the materials handling systems plays a vital role in a manufacturing industry. The elimination of non-value-added activities in these material handling systems reduced the production cost and improves the productivity of an organization

- Concept of leans' Set in Order that is, "A Place for Everything and Everything in Its Place" is achieved.
- MUDA of Motion is minimized.
- Mass Dumping of Subassembly Part Components is prevented.
- Unnecessary inventory of part components is controlled.
- No Material Wastage due to slippage.

References

[1] Ghazi Abu Taher et.al." "Automation of Material Handling with Bucket Elevator and Belt Conveyor" International Journal of Scientific and Research Publications, Volume 4, Issue 3, March 2014.
[2] Abhilasha Dongre et.al, "Significance of Selection of Material Handling System Design in Industry – A Review" International Journal of Engineering Research and General Science Volume 3, Issue 2, March-April 2015.
[3] Sangmesh Pattar et.al, "Experimental and finite element analysis of hydroforming process for stepped die" IOSR Journal of Mechanical and Civil Engineering, pp. 18- 22, 2014.