

Design and Development of Three Wheel Drive Fork Lift for Warehouses

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Abstract –The mechanical field is improving day by day. Lots of innovative ideas are entering into the field. This report is indeed to endow with a comprehensive study of technical and theoretical aspects of 'FORKLIFT' all the topics covered in this report are essential for complete understanding and survey of 'FORKLIFT'. The three wheel forklift is designed to make process of stocking warehouses safer and more efficient. With currently manually operated forklift, there is need of human efforts which causes fatigue to operator. The three wheel forklift will limit the need for employees to operate forklifts manually. This will also reduce the chance of injury among employees as well. Our model takes pallets to and from the docking area. The operator can choose the direction and what they want the forklift to do by way of hand held user interface. It uses servomotor to load and unload the load through lead screw. In our project we have studied, designed and modified the product called Forklift machine. The report engrosses different chapters and each is designed in organized style.

Keywords- Fork lift, Lead Screw, Servomotor.

I- INTRODUCTION

A forklift (also called lift truck, fork truck, fork hoist, and forklift truck) is a powered industrial truck used to lift and move materials over short distances. The forklift was developed in the early 20th century by various companies, including Clark, which made transmissions, and Yale & Towne Manufacturing, which made hoists. Since World War II, the use and development of the forklift truck have greatly expanded worldwide. Forklifts have become an indispensable piece of equipment in manufacturing and warehousing. In 2013, the top 20 manufacturers worldwide posted sales of \$30.4 billion, with 944,405 machines sold. The Automatic Forklift System (AFS) is designed to make the process of stocking efficient while decreasing unnecessary work

related spending. A one-sixth scale model forklift is being used to demonstrate the feasibility of the project. An operator will control the system at a safe distance away from the forklift, such as in a separate control room, decreasing the risk of work related injuries with a handheld user interface. The Automatic Forklift System is capable of the following operations: receiving commands from the operator, navigating through the modeled warehouse, retrieving and placing pallets at desired locations.

This device the lead screw fork lift has been developed to today itself the needs of small and medium scale industries, who are normally man powered with very minimum of skilled labors. In most of the industries the materials are lifted by using high impact man power and more amount of skilled labors. In order to avoid all such disadvantages. This, fork lift has been designed in such a way that it can be used to lift the material very smoothly without any impact force. The operation is made be simple that even an unskilled labor can handle.

It is movable from one place to other place easily by a proper wheel arrangement. Material handling is a specialized activity for a modern manufacturing concern. It has been estimated that about 60-70% of the cost production is spent in material handling activities.

II- METHODOLOGY

The mini forklift will run on 2 dc motors and can drive small weight with pickup arrangement across small distances easily. For this we use a mini 3 wheel vehicle body frame designed with a platform with 2 wheel mounts. It has a perpendicular handle ahead to hold on as well as take turns that allow the vehicle to be controlled by person on it. Also we design a forklift type

mechanism on the front handle of vehicle using 2 bent metal strips and lifting mechanism. The lift mechanism comprises of wire rope or lead screw mechanism for small goods transportation in industrial sector. The demonstration version can lift 10 – 25 kg to demonstrate the concept. For lifting purpose we have two options to lift by using wire rope or by using lead screw threaded bar. Wire ropes are designed to pull or to lift and some are designed just to pull. The main factor that decides if wire rope can be used to lift, pull or both is the factor of safety and type of applications where forklift is being used. Also with help of lead screw threaded bar it has been developed to today itself the needs of small and medium scale industries, who are normally man powered with very minimum of skilled labor. three wheel forklift is movable from one place to other place easily by a proper wheel arrangement. Material handling is a specialized activity for a modern manufacturing concern.



Fig. 1- Forklift Isometric View

III- DESIGN

Design Methodology

In our attempt to design a special purpose machine we have adopted a very a very careful approach, the total design work has been divided into two parts mainly;

- ✓ System design
- ✓ Mechanical design

System design mainly concerns with the various physical constraints and ergonomics, space requirements, arrangement of various components on the main frame of machine no of controls position of these controls ease of maintenance scope of further improvement; weight of m/c from ground etc. In Mechanical design the component in two categories.

- Design parts
- Parts to be purchased.

For design parts detail design is done and dimensions thus obtained are compared to next highest dimension which are readily available in market this simplifies the assembly as well as post production servicing work.

The various tolerance on work are specified in the manufacturing drawings the process charts are prepared & passed on to the manufacturing stage. The parts to be purchased directly are specified & selected from standard catalogues.

System Design

In system design we mainly concentrate on the following parameter

System selection based on physical constraints:-

While selecting any m/c it must be checked whether it is going to be used in large scale or small scale industry In our case it is to be used in small scale industry So space is a major constrain. The system is to be very compact it can be adjusted to corner of a room. The mechanical design has direct norms with the system design hence the foremost job is to control the physical parameters so that the distinction obtained after mechanical design can be well fitted into that.

Arrangement of various component

Keeping into view the space restriction the components should be laid such that their easy removal or servicing is possible moreover every component should be easily seen & none should be hidden every possible space is utilized in component arrangement.

Components of system:-

As already stated system should be compact enough so that it can be accommodated at a corner of a room. All the moving parts should be well closed & compact A compact system gives a better look & structure.

Man –m/c Interaction:-

The friendliness of m/c with the operation is an important criterion of design. It is application of anatomical. Following are some e.g. of this section

- ❖ Design of machine height
- ❖ Energy expenditure in hand operation
- ❖ Lighting condition of m/c

Chances of failure

The losses incurred by owner in case of failure of a component are important criteria of design. Factor of safety while doing the mechanical design is kept high so that there are less chances of failure there over periodic maintenance is required to keep the m/c trouble free.

Servicing facility:-

The layout of components should be such that easy servicing is possible especially those components which required frequent servicing can be easily disassembled.

Scope of future improvement:-

Arrangement should be provided to expand the scope of work in future such as to convert the m/c motor operated this system can be easy configured to required one.

Height of m/c from ground:-

Fore ease and comfort of operator the height of m/c should be properly decided so that he may not get tired during operation .The m/c should be slightly higher than that the level also enough clearance be provided from ground for cleaning purpose.

Weight of machine:-

The total wt of m/c depends upon the selection of material components as well as dimension of components. A higher weighted m/c is difficult for transportation & in case of major break down it becomes difficult to repair.

IV- CONCLUSION

The project work "Battery operated forklift" is aimed to control through lead screw. The main advantage of using this technology is to increase the safety of operator by operating the forklift from certain distance. This increases the efficiency of the productivity, because human errors due to the poor visibility can be minimized. The system is designed and developed successfully, for the demonstration purpose prototype model (mini model) is constructed. After going through these collected data and statistics from various journals as well as research papers; we came to conclusion that remote controlled lead screw is the only way to stop such industrial issues like labor cost, hazardous material handling. Our project has a simple electrical heart and a simple mechanical body. It can be modified into any high class application. Considering the project time and

all the necessary steps, we concluded this project is the right one. Since just a simple modification in its mechanical arm and movement way, we can convert into any robot that can perform a special type of work. We can use our human brain but the hands and legs of a robot, and thereby nullifying the chances of accident. As this is the simplest one, we have got wired remote for manual operating. It can be modified into any high class application. We came to conclusion that remote controlled fork lift is the only way to stop such industrial issues like labor cost, hazardous material handling.

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