

“Design and Analysis of Two-Wheel Drive Forklift for Industrial Warehouses”: A Review

Nishant Bhoyar*1, Dr. P.G. Mehar*2

*1M. Tech Student, Mechanical Engineering Design, K. D. K. College Of Engineering, Nagpur, India.

*2 Associate Prof, Mechanical Engineering Design, K. D. K. College Of Engineering, Nagpur, India.

ABSTRACT

Forklifts are used to loading and unloading the heavy goods as well as the raw materials in industrial warehouses. Normal forklifts are designed in such a way that it can lift up to 5000 pounds itself weight and as maximum as 9000 pounds. The average weight which can be carried out with the help of fork lifter is up to 4000 pounds.

In today's life forklift can be used in almost all the companies for the transportation and also loading and unloading purpose. New forklifts are designed in such a way that it can rotate 90 degrees with the help of rotating forks which is attached to the truck body from both the ends. There are totally 8 child parts are used for making the fork lifter. In other hand the forklifts which is used in warehouses are most expensive that's why around 70% warehouses retrieve products manually.

As per the experiments and design the travelling distance of forklifts can be reduced by 27-37 % when RF-based process can be used. According to design we calculate all the properties of child parts and subassemblies. From this we can calculate the stability of the forklifts, And the results shows that we can use Centre of gravity as its safety triangle.

By using the finite element method, we can calculate all the stress which can be applied during the load. Based on the result obtained from FEM, we can calculate maximum loading condition at different working conditions.

KEYWORDS: RF-Based Process, FEM, Maximum loading conditions etc.

I.INTRODUCTION

In general, the forklift is defined as the tool which is useful for lifting the hundreds of kilograms of the goods. Nowadays the main issue that can be observed is that, transportation problems, increase productivity for that reasons the travelling of forklifts are examined. The Research has found that 75% companies can handle the material or transport the material manually. Because forklifts are the most expensive due to Labouré, equipment and maintenance cost.

Most of the forklifts also used for outdoor activities. The maximum forklifts operate on petrol, while some forklifts use the diesel or natural gas. Rough terrain forklifts are capable for lifting the heavy goods and also its highest loading capacity. With the help of fork lifter, it is possible to move thousands of kilograms with the help of single person. Well maintained and safely operated forklifts reduces the chances of accidents and it is easier for handling.

The forklift has two metal forks on the front side which is used for lift the cargo. The forklift operator drives the forklift in forward direction until the fork push under the cargo. The forks are also known as blades or tines, which are generally made up of steel and can lift up to a few tons. Forklifts are either powered with the help of gasoline, propane as well as electricity. Electrical forklifts can be operated by using the relays of battery.

OBJECTIVES

1. To made fork lifter automatic driven by using controllers.
2. To improve the load carrying capacity of the heavy goods.
3. Material handling is easy and also reduces the man power.
4. The mini forklifts which are running on only 2 DC motors are used for lifting the small weight with pickup arrangement across distances easily.
5. Forklifts reduces the accidental losses.
6. The device was to move using motorized wheels and would be able to turn using swivel caster wheels.
7. The batteries were to be mounted on the device underneath the device next to the wheels and off the ground, or otherwise concealed from the audience. The fork lifter was controlled either by remote control or by another person or via switches by the user.
8. The forklift must allow the user to move forward direction, backward direction and side directions all while balancing. It is necessary for it to go backwards. It must also be considerably quiet and its noise is also very less, as the audience is only a few feet away from the performers and loud motor noise would give away the “magic” of the angel’s smooth and easy movement.

II.LITERTURE REVIEW

1. The forklifts are the most important part of today’s supply unit where it’s transporting heavy goods from one location to another location in the storage, loading or unloading good to the truck the forklift utilized. The two-wheel hand operated forklift was first appeared over one hundred years ago. These original units which is made up of wrought-iron axle and cast-iron wheels which enabled loads to be lifted and transported without manual labor.
2. In the era of early 19th century, the new revolution was found in which horizontal and vertical motions are combined resulted in the first-hand operated forklift which is capable of lifting only a few inches from the ground and with this the development of the forklift are on FastTrack till today.
3. In 1917 the company named as Clark, started manufacturers of axles which is used for the movement, and created a truck called the Truc tractor to move the materials from one place to other place around their factory in the various units of the plants, and some material is also transport outside of the plant.
4. As visitors to the factory saw the Truc tractor which is capable for loading and unloading the heavy goods at work they are also interested to use Truc tractor for transportation in their own plants so they placed orders to Clark to build Truc tractor for their companies. After few years the first hydraulic powered lift was added to some trucks to give them higher lifting power.
5. In 1923, company named Yale is the first manufacturing company to use forks that lifted loads off the ground and an elevated mast can be used that could extend beyond the height of the truck.
6. The Yale truck is considered as to be the first best fork lifter, but it is not meet all the requirements that’s why After few developments helped the forklift to increase in production including the standardized pallet in 1930s and World War II. Both of these developments increased production of forklifts and allowed distributors and investors for buying because it is capable of lifting the heavy goods inside the factory as well as outside the factory.
7. 'Load Centre’s represent the middle part of a forklift truck load, from front to back. Load Centre can be easily calculated by measuring the load to be carried, and dividing by two.
8. The load Centre is the distance from the face of the forklift to the load's Centre of gravity. Many forklifts are rated using a 24-inch load Centre, which means that the load’s Centre of gravity must be 24 inches or less from the face of the forks.

III.METHODOLOGY

A forklift; is known as self-generated or self- propelled vehicle because it can operate without any support, and some forklift operate on battery-powered industrial machine; Its main purpose is for material handling among facilities or compounds as well as outside the compounds. Particularly the potential to elevate masses to be positioned at height also on lower them. These are connected with specific attachments, the fork elevated machine is also made to perform alternative connected functions like the transfer masses from slip sheets onto pallets, also to clamp them or to invert them.

The chassis was designed to sustain a static load is up to 80 kg. There is wheel shod the motors and is attached to the frame or casing. The driving motors are positioned below the frame. The frame incorporates hole for attaching front wheel, and; for attaching the fork lifter. Battery is used for providing the power to the wheel. The battery is placed at the rear platform. Most of the time a 12-volt battery used to provide power.

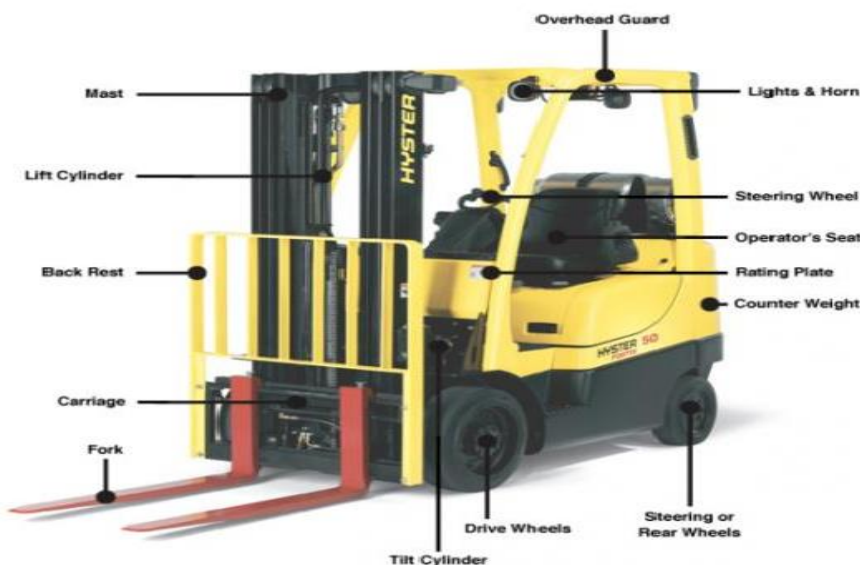
D.C. motor is used in my project for moving the fork from one place to another, and carrying objects from one location to other; my project consists two motors which is run the 2wheels; whereas the lifting portion is completed by lead screw and it is connected to another motor.

IV.WORKING PRINCIPLE

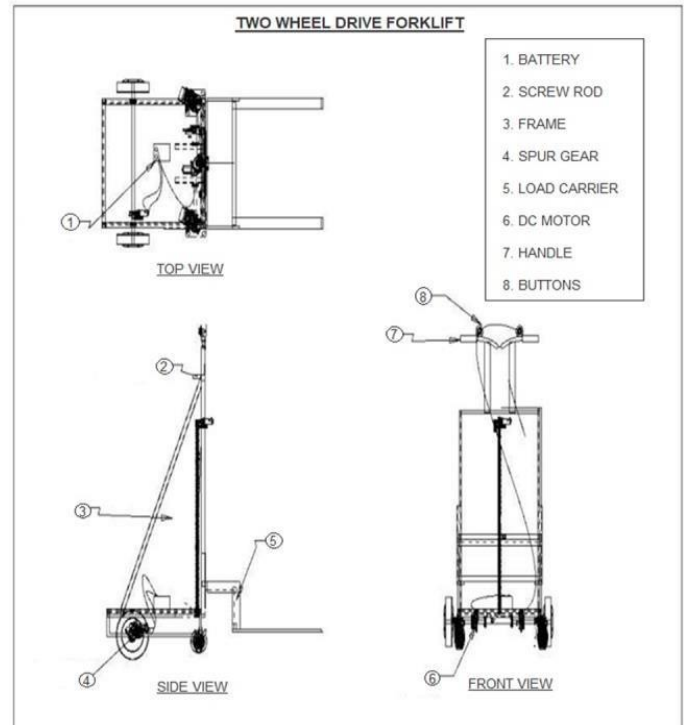
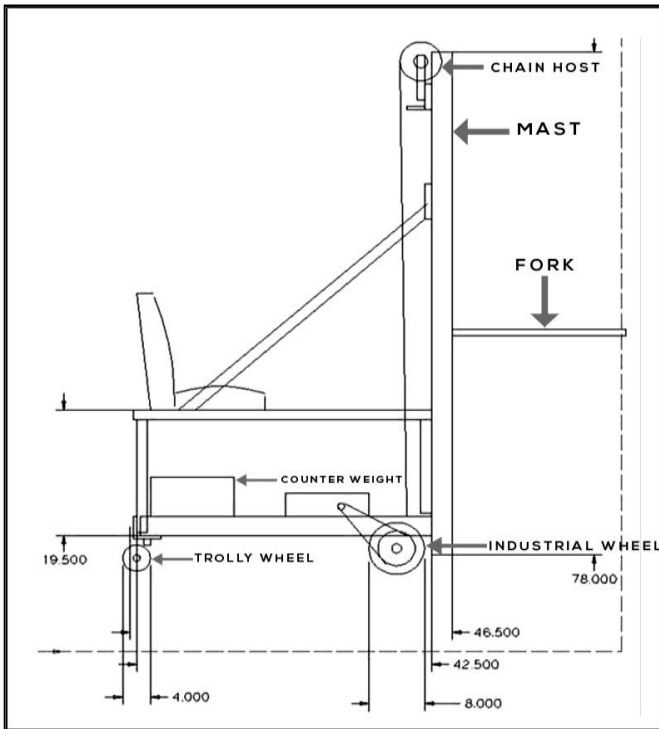
The forklift mechanism is based on the principle of Semi-Electric method. In this method power are transmitted from one place to another place by using the combination of mechanical and electrical instruments. The project works on the principle of transferring the rotational motion into the linear motion. For this reason, we can use here 12V, 2.5A D.C motor. The arrangement of motor is connected to the wheel. The vehicle is run with the help of motor. The motor is attached with battery for taking the power.

The motor is connected to the spur gear having linear motion which increases the torque value and the wheel is directly coupled by the torque in the form of bearing from this the vehicle can run fastly. There is a control unit which control the motor actions. The major advantage is that pollution cannot occur.

The lead screw is assembled or attached vertically on the guide column and the attachment of fork is done with the help of lead screw. With the help of motor, the rotational motion of the lead screw is converted into linear motion. At front line of the platform the forklift positioning is assembled. The safety is the main point which is to be considered while making the design of the forklift, where the forklift is in the course of loading and the stability of moving system consist point of 3 contacts, 2 rear rotary wheel drives and one in front of 2supporting wheel.



DIAGRAMS

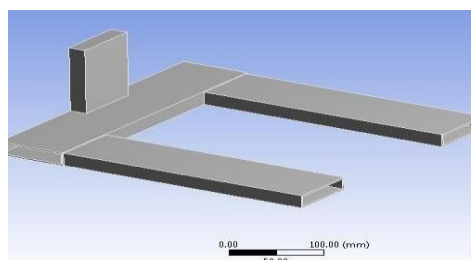


REQUIRED COMPONENTS

1. Base
2. Lead Screw
3. Remote Controlled System
4. Chain drive
5. Slider
6. Fork
7. Mast
8. DC Motor
9. Chain Block
10. Battery

1. Base (Chassis):

The chassis is fabricated or made up of Plywood sheet. Base are done for ease of fabrication, and to reduce the overall weight. The chassis was designed in such a way that to take a static load of 3kg. The flange which holds the motor was designed and it is made up of aluminum and is bolted to the chassis so that the driving motors can easily accommodate below the chassis .and also, for attaching the lift structure (mast).



2. Lead Screw:

A lead screw sometimes called a power screw or translation screw. It's used to translate turning motion into linear motion. In my project lead screw is used for lifting a fork in upward direction as well as downward direction.



3. Remote Controlled System:

The forklift is controlled with the help of 6 manual keys. By activating these keys manually, all the movements can be created in the forklift. All these 6 keys are directly interfaced with electrical bridge circuit at input side, one end of all the keys is shorted together and connected to the ground. When any key is pressed, biased current is transmitted to the next node and follows, based on this bias the circuit drives the motor.

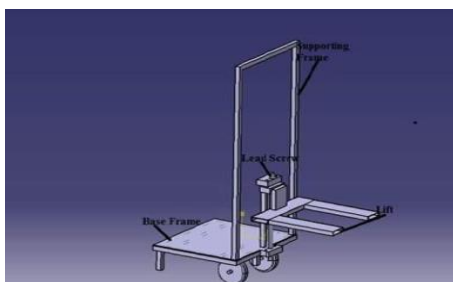
4. Chain Drive:

Chain drive is a type of mechanical power transmission system. In my project requirement I use bicycle chain for the purpose of transmitting the motion. Chain drive is passing over the sprocket gear, with the teeth of gear meshing with the holes in the links of the chain. The fig. 7 shows the chain drive.



5. Slider:

It's a rectangular plate which is held between two vertical channels of aluminum which are free to slide up and down to lift and lower the weight/load up to a desired limit with the help of rope which is connected to the DC Motor by means of Shaft and Bevel gears.



6.Fork:

It is a cantilevered arms attached to the frame and mast for lowering and raising the carriage load. It is the principle working part that directly deals with the working load.

7.Mast:

The mast is the vertical support that permits raising and lowering the carriage load. The carriage load is lifted and lowered using the fork and lifting mechanism assembled on the mast. The mast also acts as a part of frame. The mast is designed by considering the maximum load that is to be lifted by the fork i.e., load acting on it and the height up to which the load is to be lifted. The manufacturing process includes welding, grinding, drilling, cutting etc.

8.DC Motor:

The Dc Motor is the driving power provided for the movement in forward and reverse direction. The Dc Motor used has the rated input of 24 volts, 350 watts, each individual front wheels have separate motors.



9. Chain Block:

The chain block is connected to DC Motor to lift the load. The chain block help in gaining the initial torque which reduces the vibrations or jerk while lifting and reduces the chance of failure.

10.Battery:

It supplies power to motor and gear box which runs the wheel and barrel. 12-volt battery is used to supply power.

Other components:

1.Axle

2.Switch: -2-wayswitch

This switch is used for selecting direction of forklift.

V.CONCLUSIONS

After completing the major project on “Fork lift” I am much happy and I would like to thank to my professor, guides and the lectures of the concerned department who have guided me.

While making this project I have been able to learn a lot and understand the various aspects of “fork lift” I can use my knowledge, which I get during my project study.

The purpose of this paper was to focus on the solving problems at the warehouses by using the fork lifter we can carry the heavy goods from one place to another place with the help of this we can avoided the accidents which can be happened during the transportation of heavy goods. The Fork lifter are designed for the purpose of increase work efficiency,

reducing power Consumption, aisle for movement in narrow space of warehouses, high safety factor, time saving application, easy controlling both manually or self.

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