

Design and Fabrication of Two Wheel Drive Forklift

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Abstract— Material handling involves the short distance movement, storage, protection and control of materials and products. Material handling equipment are used to reduce costs and maximize productivity. A forklift truck is an industrial truck used to pick up and relocate materials. It is an essential piece of equipment in manufacturing and warehousing operations. Lift trucks are widely available in many variants and load capacities. There are numerous goods weighing around 40 – 50 kgs that are comparatively lighter but not an easy task for human labor to move or transfer them. To fulfill this need we design a 2-wheel drive forklift to lift and transport the goods compact and lighter in size across factories & industrial warehouses. The 2-wheel drive is a fast, efficient and low power consuming vehicle that can work in smaller spaces.

Keywords— Forklift, Material handling, 2-wheel drive.

I. INTRODUCTION

A forklift is an industrial truck used to lift and transport materials over short distances. A Forklift truck is one of the most used machines employed for several types of tasks. They range from warehouse use to large scale industry with multiple locations. They make lifting of heavy objects fast and a lot easier than manual lifting. There are numerous varieties of forklifts to select from going well with your requirements and necessities. Forklifts either uses propane, gasoline or electricity as a source of power for its operation. Electric forklifts rely on batteries for its operation [7]. Gasoline or propane powered forklifts are sometimes stronger or faster than electric forklifts, but they carry more problems related to maintenance and cost. Electric forklifts are perfect for warehouses because they do not pollute environment with harmful fumes like gas powered machines do. So here we design Two Wheel drive forklift using SOLIDWORKS and ANSYS [6], which uses electricity as a source of power and instead of hydraulic mechanism it will use motor for lifting loads with the help of forks. This will be useful in carrying loads which are less in weight usually 40-50 kg and hence will be proved better for inhouse operations.

II. PROBLEM STATEMENT

There are many goods or components are available weighing around 40-50kg in warehouses.

Problems associated with transportation of these loads inside warehouses.

They are listed below:

- Lack of proper vehicle for handling loads weighing around 40-50kg.
- Forklifts powered by diesel or gasoline are not good for environment.
- Normal forklifts are not compact.

Using regular forklift for such a load is also not a suitable choice, as it would be waste of time and money to use those forklifts which are designed for heavy loads. Also forklifts which uses diesel or gasoline as a fuel will also be harmful for environment. So, we need a vehicle which can work for load of 40-50kg [4], without polluting the environment and compact also.

III. OBJECTIVE

Objective of this study is to increase productivity in the industry by reducing the time involved in transportation of small goods. It also reduces the human fatigue.

- To safely pickup and carry the load from one point to another point in warehouse, for small distances.
- To reduce the time involved in transporting light weight goods.

- To carry goods through narrow passages, since it's difficult for regular forklift due to size.
- To carry goods efficiently, since less energy consumed in operation.
- To get better source of power as using battery for powering the forklift will reduce the pollutant exhausted by forklift.

IV. CONSTRUCTION

Counterweight: Counterweight is a heavy mass placed at the rear portion of the forklift truck. The purpose is to balance the load lifted by fork. In forklift many small components including large battery serves as counterweight.

Wheel: Wheels allow easy movement of heavy load with least effort. Here we use solid tyres for our forklift.

Fork: The fork is the key component of the forklift. It is used to pick up the goods from ground and hold it at some height. These are two bend strips made by iron. The face of the fork of is very sharp and tapered.

Slider: Slider is the vertical assembly that does the work of raising and lowering the load. Interlocking rails structure provides lateral stability and guide also, Mounted to the frame of the forklift.

Handle: A handle is a part of an object that can be moved or used by hand. In our forklift handle is used for only giving the support to the operator not for taking the turning of the forklift. The handle is made by using the hollow iron rod.

D.C. Motor: D.C. Motor used in our project for moving fork lift from one location to another. Our project has used three number of motors in which two motors are used to run the rear wheels while one motor is used to lift the load.

Axle Shaft: Shaft is a mechanical component which is responsible for transmission of torque and rotational motion, used to make connection between components placed at larger distance or for relative movement between them.

V. METHODOLOGY

To have our project up and running following steps have been followed.

5.1 Project Idea

First, the idea of project is developed based on the information we gathered from research papers, considering this as main part of our project initiation we spent enough amount of time on deciding perfect idea of project, how it looks like and how it should perform for specific application.

5.2 Rough model

Rough model is designed in SOLIDWORKS for better idea of all components which are going to be used in our project and the location of those parts for better and efficient operation.

5.3 Calculation

After finalizing the idea and rough model, we calculated dimensions of all the components of our project, including the power of motors, the materials we are going to use.

5.4 Final solid model

Solid model is prepared on SOLIDWORKS by making changes in our rough solid model based on the values we got from calculations.

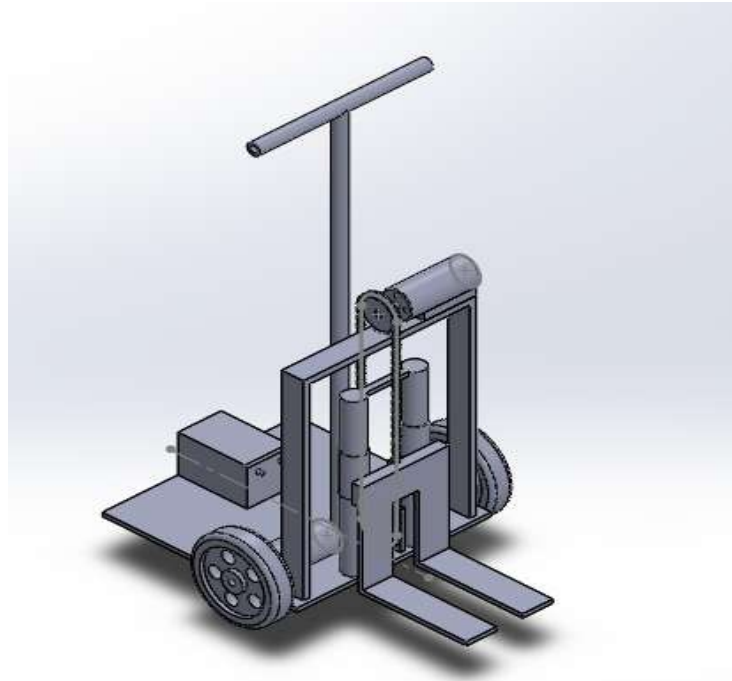


Fig.1 3D Solid model of Forklift

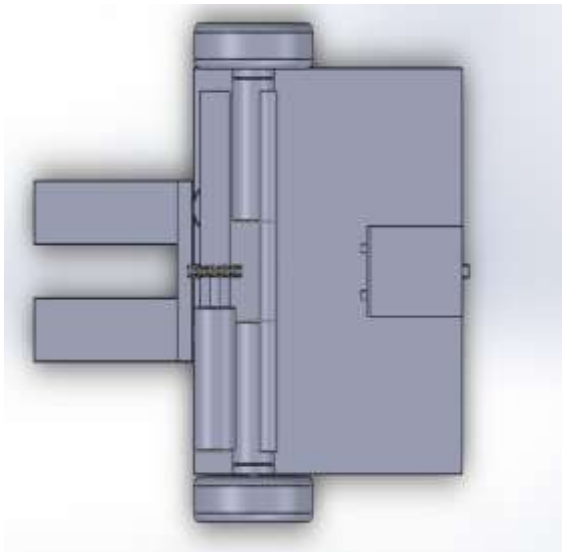


Fig.2 Top view of Forklift



Fig.3 Side view of Forklift

5.5 Analysis

Analysis is done in ANSYS software on fork which is key component of our assembly, to ensure our design is safe and will perform to its desired capacity.

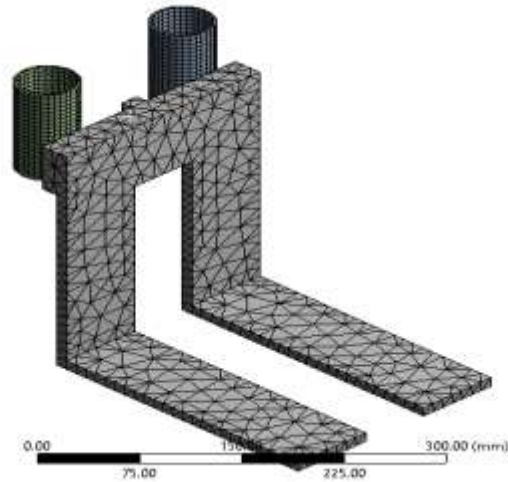


Fig.4 Mesh of Fork

A: Static Structural
 Total Deformation
 Type: Total Deformation
 Unit: mm
 Time: 1
 05-11-2018 12:51

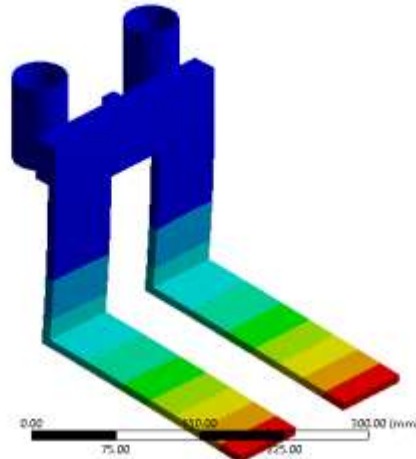
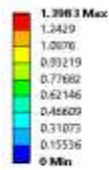


Fig.5 Total deformation

A: Static Structural
 Equivalent Stress
 Type: Equivalent (von-Mises) Stress
 Unit: MPa
 Time: 1
 05-11-2018 13:54

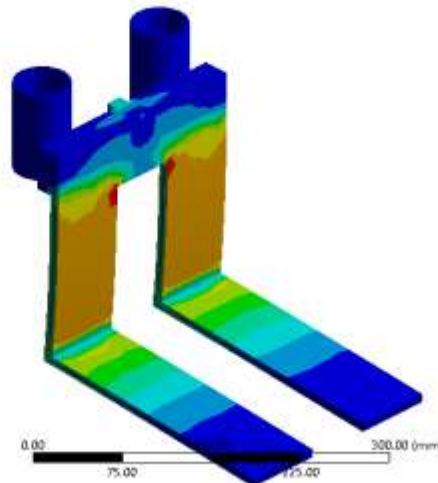
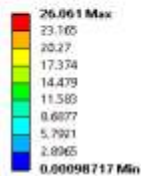


Fig.6 Equivalent stress

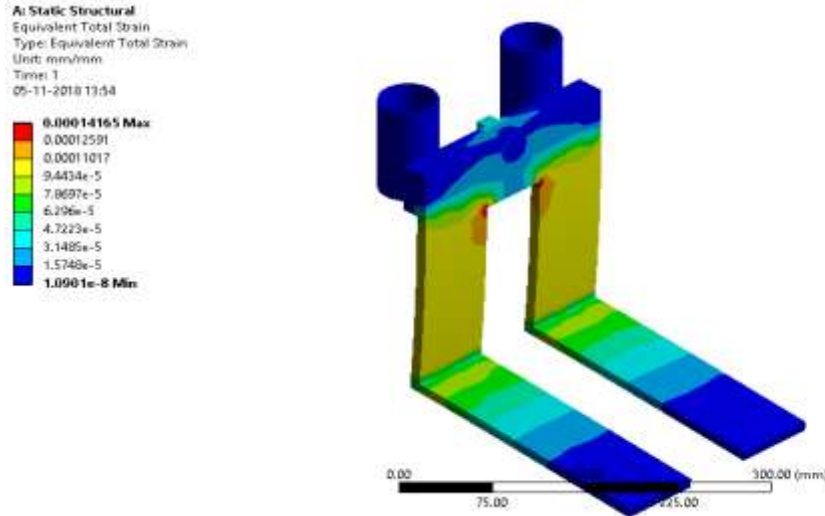


Fig.7 Equivalent total strain

5.6 Assembly and testing

After everything on paper is finalized, actual work starts here. All components are procured, and manufacturing operations are performed for smooth assembly, and assembly is done based on our final design. Testing is done to ensure desired performance of the forklift and changes are made to the parts throttling the performance or operation of all parts.

VI. CONCLUSION

Our project two-wheel drive forklift will be helpful for small scale industries as it is easy to operate with less cost and indirectly it will save the labour cost. Also, it uses pollution free source of energy that is electricity. So, for handling light loads this machine serves as perfect companion. Savings resulting from use of this machine will make it pay for itself with in short period of time & it can be great companion in any field dealing with light weight loads. Although for now it's able to lift weight of 40-50kg only but for future aspect we may look for modification in design for lifting greater load pertaining compact and Light weight body.

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