

# Design and Fabrication of Three Wheeler Drive Forklift for Industrial Warehouses

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**Abstract**– - Mechanical forklift is an improved and advance technology that helps brought about revolution in the mechanical industries today all heavy engineering company uses it. Widespread use of the forklift truck had revolutionized warehousing practices before the middle of the 20th century. A mixture of material handling systems is in the use, exact from that entirely physical to the ones that are semi-automatic but manually controlled. Forklifts have revolutionized warehouse work. They made it possible for one person to move 100 kg at once. Well-maintained and safely operated forklifts make lifting and transporting cargo infinitely easier. This is the general description of a normal forklift truck.. In the warehouses forklifts are the most expensive machines. The study pays special attention to the travelling of these machines. Factories, industries and storage go downs need forklifts and cranes for storage and moving large goods. Also there are a number of goods weighing around 40 – 60 kg that are comparatively lighter but cannot be moved around easily by human labour. To fill this need we here propose a three wheel drive forklift to lift and transport such medium weight goods across factories & industrial warehouses. The three wheel drive is a fast, efficient and low power consumption vehicle that does not require much space to move around. The mini forklift will run on a hub motor and can drive small weight with pickup arrangement across small distances easily. For this we use a mini three wheel vehicle body frame designed with a platform with motorized wheel mounts. It has a perpendicular handle ahead to hold on as well as take turns. To make the project work more realistic, much importance is given for practical orientation, therefore a prototype module is constructed for the demonstration purpose. This module simulates the real working system & based on this technology with slight changes in the structure & motor ratings, the system can be converted for real applications.

**Key Words** - forklift, warehouse, cargo, hub motor

## I. INTRODUCTION

In general the forklift can be defined as a tool capable of lifting hundreds of kilograms. A forklift is a vehicle similar to a small

truck that has two metal forks on the front used to lift cargo. The forklift operator drives the forklift forward until the forks push under the cargo, and can then lift the cargo several feet in the air by operating the forks. The forks, also known as blades or tines, are usually made out of steel and can lift up to a few tons. Forklifts are either powered by gasoline, propane, or electricity. Electric forklifts rely on batteries to operate. Gasoline or propane forklifts are sometimes stronger or faster than electric forklifts, but they are more difficult to maintain, and fuel can be costly. Electric forklifts and hydraulic forklift are great for warehouse use because they do not give off noxious fumes like gas powered machines do. A forklift is a one type of power industrial truck that comes in different shapes, sizes and forms. A forklift can be called a pallet truck, rider truck, fork truck or lift truck. Yet, the ultimate purpose of forklift is the same to safely allow one person to lift and moves large heavy loads with little effort.

Hydraulic forklift also know as hydraulic hand pallet is a tool used to lift and transport heavy load for long distances with the help of pallet. Pallet jacks are the most compact and modern form of forklift and are intended to move heavy and light weight material within a warehouses. For the purpose of training, a forklift is a small or large industrial truck with power operated platform. Like other forms of forklift hydraulic forklift doesn't require any kind of electric power source or diesel and gasoline because hydraulic forklift works on principle of hydrostatic force transmission. Lifting of heavy loads are accomplished with the help of hydraulic cylinder in the forklift. Cylinder is generally fitted at lower parts of fork. Forklifts are most often used in warehouses, but some are meant to be used outdoors. The vast majority of rough terrain forklifts operate on gasoline, but some use diesel or natural gas. Rough terrain forklifts have the highest lifting capacity of all forklifts and heavy duty tires (like those found on trucks), making it possible to drive them on uneven surfaces outdoors. Forklifts have revolutionized warehouse work. They made it possible for one person to move thousands of pounds at once. Well-maintained and safely operated forklifts make lifting and transporting cargo

infinitely easier. This is the general description of a normal forklift truck. To make the project work more realistic, much importance is given for practical orientation, therefore a prototype module is constructed for the demonstration purpose. This module simulates the real working system & based on this technology with slight changes in the structure & motor ratings, the system can be converted for real applications.

## II. HISTORY OF FORKLIFT

Just like many other inventions, the forklift was born out of necessity. In 1917 the Clark Company, manufacturers of axles, created a truck called the Tructractor to move materials around their factory. As people visited the factory and saw the Tructractor at work they placed orders from Clark to build Tructractors for their companies. A few years later the first hydraulic powered lift was added to some trucks to give them lifting power. In 1923, Yale was the first company to use forks that lifted loads off the ground and an elevated mast that could extend beyond the height of the truck. The Yale truck is considered to be the first forklift.

A few developments helped the forklift to increase in production including the introduction of the standardized pallet in 1930 and World War II. Both of these developments increased production of forklifts and allowed distributors the means to efficiently move heavy loads. As the use of forklifts increased so did the amount of hours they were being used. Shortly after forklifts became prevalent, they were designed with a rechargeable battery that could last 8 hours. In the 1950s warehouses expanded upward instead of out so forklifts were designed to lift loads up to 50 feet (15.2 meters), which was higher than ever before. With the increased load height, certain safety measures were applied to the forklift during this time including a cage for drivers to prevent them falling materials and a backrest to help keep the load in place as it's lifted. More safety measures were introduced in the 1980s including the operator safety restraint and developments in forklift balance technology.

## III. LITERATURE REVIEW

### 2.1 Burinskiene:"The Travelling of Forklift in Warehouse".Retrieved 2008-01-22.

After conducting an intensive literature review, it was found that Extreme pressure is placed on all functions of traditional warehouse. The warehouses have to be flexible and have possibility to increase or decrease its operations in order to meet any demand. This has both advantages and challenges. A key advantage is that warehouses are ready to underlay economic trends and seasonality. A key challenge is that they have to stay competitive in today's market. This means that

managers and engineers must continue to improve the performance of their warehouse operations.

### 2.2 Brindley, James (December 2005). "The History of the Fork Lift". Warehouse & Logistic News.Archived from the original on 2009-08-31.Retrieved 2008-01-25.

In 1906, the Pennsylvania Railroad introduced battery powered platform trucks for moving luggage at their Altoona, Pennsylvania train station. World War I saw the development of different types of material handling equipment in the United Kingdom.

### 2.3 Dr.R.N.Mall (2013), Automated Guided Vehicle, ISBN 2091 Journal, MMMEC, Gorakhpur.

In market there are several types of forklifts are used in warehouses. These forklifts are either powered by gasoline, propane or electricity but they are more difficult to maintain and fuel can be costly which takes more space. To overcome this entire problem we designed and fabricate the three wheel forklift which drives on electric power and loading & unloading is done by hydraulic jack through forks. In general, there are a lot of activities in traditional warehouses. Product typically arrives packed on a large scale and leaves packed on a smaller scale. In other words, the most of products arrive in pallets, but leave packed in cases; some very fast-moving products are received in pallets and are shipped in pallets. In almost all supply chains, raw materials, parts, and product inventories still need to be stored or buffered. In warehouses products are received in pallets, placed to storage or pick locations, picked and sent to customers. So, the material flow is based on following activities: receiving, put-away, keeping in buffer, refilling (replenishment), picking and shipping. The receiving activity includes the unloading of products from the transport carrier, updating the inventory record, finding quantity or quality inconsistency. Put-away involves the transfer of incoming pallets to storage locations. Also put-away includes physical movements between different functional areas. Pallet pick is considered as retrieval of pallet from storage location to shipping doors. In our project, we tend to square measure exploitation the battery power for the horizontal movement the vehicle and therefore the human power to carry the cargo or packaged product from the bottom.

### 2.4 Kaushik S. Panara<sup>1</sup>, Vivek R. Mishra<sup>2</sup>, Amrat M. Patel<sup>3</sup>, Tushar B. Patel<sup>4</sup> and Krunal R. Dhivar<sup>5</sup>, Construction of Battery Operated Forklift, ISSN (online): 2349-784X, IJSTE - International Journal of Science Technology & Engineering | Volume 2 | Issue 4 | October 2015

The mechanical structure of this prototype model is constructed with metal plates, this structure looks like a rectangular frame& the vertical moving mechanism that contains

metal forks is assembled over the structure at front side. Since it operates through hydraulics, it contain cross four bar steering mechanism. The DC Motors are having reduction mechanism, there by speed is reduced and torque is increased. The mechanical system is considered as motion converter, this can be created by implementing electro-mechanical Techniques. The concept is to transform the motion from one form to some other required form by using suitable mechanical & electrical devices. In this research work the technique of transform the rotational motion in to linear motion is implemented.

**2.5 K Nanthakumar<sup>1</sup>, M Arun<sup>2</sup>, K Ranjith kumar<sup>3</sup>, R Sabarinathan<sup>4</sup> and K Yuvaraj<sup>5</sup>, Design and Fabricated Pneumatic Operated Forklift, ISSN 2319-5991, IJERST Vol. 4, No. 1, February 2015.**

Electric forklifts and hydraulic forklift are great for warehouse use because they do not give off noxious fumes like gas powered machines do. For this purpose a DC motors are used to create motion in the mechanism that functions as forklift. The introduction of AC powerforklifts, along with fuel cell technology, are also refinements in continuing forklift development.

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