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# Design and Analysis of Two Wheel Drive Forklift for Industrial Warehouses

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**ABSTRACT:**In today's life there are many types of forklifts that lift different platforms from large heavy trucks to those that work in narrow aisles forklifts have become one of the main tools of transportation that we use in our lives with all the forks available we find that there are some improvements that can be to bring the forklift to a better performance. This paper proposes a new two-wheel drive system that is a fast, efficient and energy-efficient vehicle that does not require much space to travel. The mini forklift will run on 2 dc motors and can drive small loads in a van configuration across small spaces with ease. Factories, industries and warehouses need forklifts and cranes for storage and transportation of large goods. Also, there are a number of goods weighing 40 - 60 kg which are relatively light, but cannot be easily moved by human labour. To fill this need here we propose 2 Wheel Automatic Electric forklift to lift and move such medium weight.

**KEYWORDS:** Arduino, Forklift, Automatic, Catia.

## I. INTRODUCTION

On the floor, lifting heavy parts or materials is a busy and dangerous job. Fork lift always plays an important role for heavy jobs, if the equipment is being properly set up for the use of right mounted forks it can be the best way to load and unload, which will make the whole process less time consuming and less labour intensive. add-on forklifts improve warehouse space utilization by eliminating the need for multiple people to handle loading and unloading operations. The value of internal transportation square footage is a standard part of a company's accounting, while the environmental impacts associated with it are often overlooked. In many cases, especially in very small and medium-sized organizations, there is an absence of Associated in Nursing with regard to the need to pay environmental fees resulting from the use of internal transport, suggesting that It applies to a mobile vehicle, such as a wheeled vehicle, excavators or loaders.

## II. LITERATURE SURVEY

1."DESIGN OF TWO AUTOMATIC FORKLIFT FOR INDUSTRY WAREHOUSES & DOMESTIC PROJECT"Lakshya Garg, Nitish Chauhan, Nikhil Tyagi UG (B.Tech) Students, Asst. Prof Department of Mechanical Engineering, Sunder Deep Engineering College, Ghaziabad.

In this research paper they researched the Wheel Automatic Electric forklift, it is a small electric vehicle designed to build a low cost forklift for industrial warehouses and home projects. A cargo transporter that can be driven by anyone. Safe movement during picking, stacking and moving loads. The power of the car is easy to control the car which means it is stable. This is prevented by two small wheels that support balancing the car and its time taken, controlling the cars to keep the car balanced.

2. "TWO WHEEL AISLE FORKLIFT"Ravi G. Kaithwas, Aniket A. Pattiwar, Rahul R. Ulmale, Ashish D.Wabhitkar UG Student, Department of Mechanical Engineering Jawaharlal Darda Institute of Engineering & Technology, Yavatmal, India.

In this paper they said that, Forklifts are designed to handle and transport goods and materials carefully and efficiently. From time to time these machines have to be moved from one work place to another. A typical sit-on forklift with a lifting capacity of 5,000 pounds will by itself weigh 9,000 pounds. The total weight of the car is about 4,000 kg. A

family car weighs more than twice as much as an average family car. This paper presents research related to the selection of methods that can be used to fill the gap between the limited power of the forklift and the use of more power to lift things from one place to another in warehouse work. The test was done with the purpose of investigating the needs of storage and building sites. With some changes in the forklift we made a two-wheel forklift, this research paper gives a good idea about how a two-wheel forklift should be useful, safe and efficient in narrow roads working with how to design and compare a two-wheel forklift for such workplaces.

3. "DESIGN, DEVELOPMENT AND MODELLING OF FORKLIFT" Ugale Sachin, Salvi Tushar, Lanjekar Sachin, Kshirsagar Prashant Mechanical Engineering Department, Final Year Students RM CET, Ambav, Ratnagiri, India. Assistant Professor, Mechanical Engineering Department, RM CET, Ambav, Ratnagiri, India.

They describe the development of forklift robots intended to work with human operators, handling palletized materials in existing, busy, well-organized outdoor warehouses. The main objective of this project is to develop a Mechanical forklift for industrial material handling. In this paper, a robotic vehicle has been developed that transports goods from one place to another using Radio Frequency Technology. Nowadays in industries, forklift is used with hydraulic system. To operate a forklift, a one-way guide is required to guide the forklift driver due to the lack of visibility. This paper discusses how to integrate Radio frequency identification (RFID) technology into a forklift truck to make it wireless to increase visibility and human safety. A forklift is a vehicle similar to a small truck with two metal forks on the front used to lift goods. The forklift driver drives the forklift forward until the forks push under the material, and then they can lift the material several feet into the air using the forks.

4. "3 WHEEL DRIVE FORKLIFT FOR INDUSTRIAL WAREHOUSE" RAJAT. RAJENDRA. WADE, DIGVIJAY. K. TAKE, MAHESH. S. DESHMUKH, PRANAW. A. RAUT Student, Department of Mechanical Engineering Jawaharlal Darda Institute of Engineering & Technology, Yavatmal, Maharashtra, India.

In today's life, there is a good variety of forks, from the big heavy duty truck to the one that works in narrow lanes. Forklift has become one of the most basic transportation equipment that we use in our life. With all the forklifts available, we find that their square measure the improvements that can be made to bring the autonomous vehicle to a much better performance. The mechanical fork lift is a developed and advanced technology that helps to cause a revolution sometimes in the mechanical industry these days all important engineering companies use it. The widespread use of the wheeled truck changed the way it was used before the middle of the 20th century. The combination of the fabric handling method is the time to be employed, which ranges from fully physical to semi-automatic measuring machines but they are controlled by hand. The self-driving car has replaced the storage function. Properly maintained and safely operated forklifts make lifting and moving materials much easier. This may be the last definition of a classic car truck. To improve any technology, this image machine is made with remote technology, where the operator can move on the part of the vehicle with wheels for high visibility & the location of the equipment is usually placed correctly (correct position), this can increase operator security.

5. "Innovative design of the lifting mechanisms for forklift trucks" Jian-Yi Wang, Jing-Shan Zhao, Fu-Lei Chu, Zhi-Jing Feng Department of Precision Instruments and Mechanology, Tsinghua University, Beijing 100084, PR China

They say that a forklift truck is one of the most important pieces of equipment. However, the overall system of the forklift truck not only obstructs the driver's vision, but also increases the overall weight of the truck and reduces fuel economy. Therefore, this paper focuses on the design of a new forklift truck lifting mechanism. First, a method for promoting multiple site links is proposed. And then, under the constraints of this machine, the movement of the fork and the fork frame is theoretically investigated. Finally, a new lifting mechanism based on it is presented and a computer simulation is used to demonstrate the motion capability. This multi-link lifting machine takes advantage of the cable drive and rigid body guide, which not only gives the operator a wider view but also reduces the overall weight of the vehicle and thus improves fuel economy.

## V. METHODOLOGY

Factories, industries and warehouses need forklifts and cranes for storage and transportation of large goods. Also, there are a number of goods weighing 40 - 50 kg which are relatively light, but cannot be easily moved by human labor. To fill this need here we propose a 2 Wheel Automatic Electric forklift to lift and move medium weight goods across factories and industrial warehouses. The 2 Wheel Automatic Electric forklift is a fast, efficient and low energy vehicle that does not require a large turning area. The mini forklift will run on 2 Brushless DC motors and can drive light loads in a van configuration across small spaces with ease. For this we use the body frame of a 2-wheeled vehicle made of a platform with mounted 2 wheels. It has a perpendicular handle on the front to hold the operator. There is plenty of room to move goods from one place to another with ease.

1. **Research:** We started the work of this project with literature survey. We gathered many research papers which are relevant to this topic. After going through these papers, we learnt about car towing machine.
2. **Optimization:** After that we decided the components which are required for the project.
3. **Design and Develop CAD Model:** - After deciding the components, the 3D Model and drafting was done with the help of CATIA software.
4. **Assembly:** The components were manufactured and then assembled together.
5. **Testing:** The testing will be carried out and then the result and conclusion will be drawn.

## VI. DESIGN & CALCULATIONS

CAD systems are available today for all major computer platforms, including Windows, Linux, Unix, and Mac OS X. The user interface often revolves around a computer mouse, but also a pen and graphic tablet. It can also be used. Manipulation can be done with the space mouse (or space ball). Some devices allow stereoscopic glasses to view 3-D models. In our old days, engineers, designers, and architects struggled to produce and deliver engineering drawings within their deadlines. It was because of the great effort they put into producing new images and edited/updated images. Every line, shapes, dimensions, sizing pictures - everything made it a head on design / writing.

The layout represents the drawing page. It usually consists of a border, a title block, dimensions, general information, and one or more views of the type shown in the viewports. Layouts are areas, similar to picture frames or windows, through which you can view your model. You zoom in on the visual fields by zooming in or out. Handwriting requires careful precision in line type, line weight, font, size and more. Standards must be established at the beginning and used regularly. With CAD, you can ensure compliance with industry or company standards by creating routines that you can use regularly. You can customize text styles, sizes, and line types.

Design calculation of lead screw = 20mm,

Efficiency of lead screw = 42%

For Chain: For number of links  $L_n = 2(a/p) + (z_1 + z_2/2) + (z_2 - z_1/2 * \pi)^2 * (p/a)$

No. of links = 111

Length of chain = 1057.28mm

For Sprocket: Pitch circle diameter-  $D_1 = 54.85\text{mm}$ ,  $D_2 = 133.59\text{mm}$

Roller seating radius(r):  $r = 3.33\text{mm}$ ,  $r_{min} = 3.2\text{mm}$

Tooth flank radius(re):  $r_{max} = 16.928\text{mm}$ ,  $r_{min} = 15.24\text{mm}$

Root Diameter (df):  $df = d - 2 * r_i = 88.47\text{mm}$



Tooth height above pitch polygon(ha):  $h_{max} = 2.9513\text{mm}$ ,  $h_{min} = 1.5875\text{mm}$

Tooth width (bf) = 5.3196mm

Fork: Motor: Torque required = 68.79Nm

Motor: We have to lift 10kg of load and we know torque required for lead screw is 32.79 N-mm

We have to lift 10kg of load and we know torque required for lead screw is 32.79 N-mm

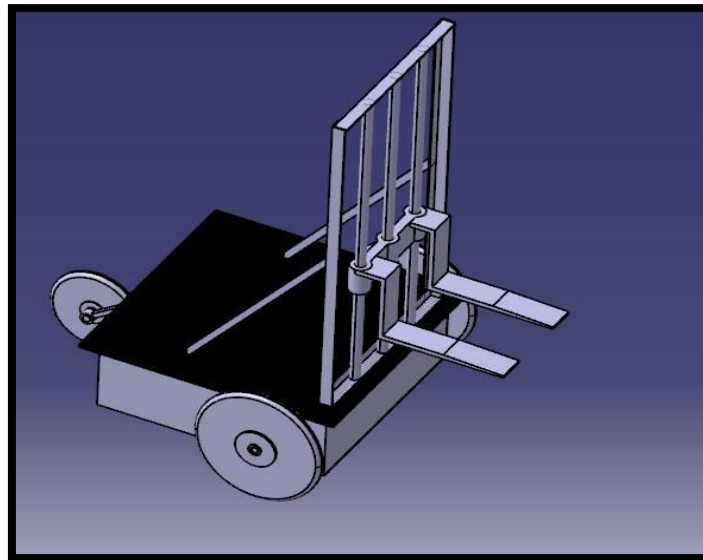
And for the drive we have assumed that the force carried by the motor is 20kg

So, therefore force =  $(20 \times 9.81) = 196.2\text{ N}$

The distance between the driven sprocket and the prime mover is 350mm

Torque =  $196.2 \times 350$

= 68670 N-mm = 68.70 N-m



## VI. CONCLUSION

The purpose of this project is to focus on solving problems in warehouses using forklifts to carry light weight and make it effective to reduce the risk that occurs in warehouses due to large forks. The two-wheel aisle forklift is designed to keep the centre of memory to increase the efficiency of the operation, reduce the energy consumption, the small scale and therefore the way to move in the narrow space of the warehouses, the high point of safety, time-saving application. However, it is important to consider the specific needs of your warehouse operation when deciding on a type of forklift. If your site deals with outdoor applications or rough terrain or requires heavy lifting equipment, a four-wheel forklift may be a more appropriate choice. Additionally, if your warehouse often encounters slippery or uneven surfaces, a forklift with improved traction features may be necessary. Finally, two-wheel forklifts offer significant advantages in terms of portability, cost-effectiveness, and suitability.

## REFERENCES

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**6. “Design and Fabrication of Battery Operated Forklift”**

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