

# DESIGN AND ANALYSIS OF TWO WHEEL DRIVE FORKLIFT FOR INDUSTRIAL WAREHOUSES

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## Abstract

The forklift, known by various names such as lift truck, jitney, fork truck, fork hoist, and forklift truck, is a vital powered industrial vehicle utilized for lifting and transporting materials over short distances. Its origin dates back to the early 20th century, where it was independently developed by several companies, including Clark, renowned for transmissions, and Yale & Towne Manufacturing, specializing in hoists. Following World War II, the global usage and advancement of forklift trucks witnessed significant growth. These versatile machines have evolved into essential equipment within the manufacturing and warehousing sectors. Notably, in 2013, the top 20 manufacturers worldwide achieved impressive sales of \$30.4 billion.

Moreover, the 2-wheel drive forklift emerges as a highly efficient and fast vehicle, characterized by low power consumption. Its compact design allows for easy maneuverability within confined spaces. Equipped with 2 dc motors, this mini forklift effortlessly moves small loads over short distances, courtesy of its pickup arrangement.

## Introduction

Lifting heavy components or materials from the floor can be a demanding and risky task. To tackle such challenges, forklifts play a crucial role in heavy-duty operations. Proper organization of cargo and utilizing the right attachments for forklifts can greatly streamline the process of loading and unloading, making it more efficient and less labor-intensive. Furthermore, forklifts optimize storage space utilization by reducing the number of personnel required for handling these operations.

While the economic benefits of internal transport are commonly considered in a company's accounting, the associated environmental consequences often go unnoticed. Particularly in small and medium-sized organizations, there is a lack of awareness regarding the environmental costs incurred through the use of internal transport, which extends to off-road vehicles such as wheeled vehicles, excavators, or loaders. Wheeled vehicles, often depicted as powerful tools capable of lifting heavy loads, are commonly employed in these scenarios.

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## Keywords

Warehouse Forklift, Side loader, Industrial Forklift

## **LITERATURE REVIEW**

In this particular research paper, the focus lies on the exploration of a unique type of forklift called the Two-Wheel Automatic Electric Forklift. This innovative forklift design aims to provide an affordable solution for both industrial warehouses and domestic settings. It serves as a compact and electrically-powered vehicle specifically designed for the purpose of transporting goods efficiently.

One notable aspect of this forklift is its user-friendly nature, as it can be operated by anyone with relative ease. This characteristic makes it accessible and suitable for a wide range of users, regardless of their level of expertise in operating such machinery.

The primary objective of the research is to examine the feasibility and practicality of implementing this Two-Wheel Automatic Electric Forklift in various contexts. By conducting comprehensive investigations, the researchers aim to evaluate its performance, functionality, and cost-effectiveness, thereby determining its potential benefits for industrial warehouses and domestic applications.

Through this research paper, the authors provide valuable insights into the design, features, and operational capabilities of the Two-Wheel Automatic Electric Forklift. They also discuss the potential advantages it offers, such as enhanced maneuverability, reduced operational costs, and a more environmentally-friendly alternative compared to traditional forklift models.

Overall, this research paper contributes to the body of knowledge surrounding forklift technology by introducing a unique and accessible solution that has the potential to revolutionize goods transportation in

both industrial and domestic settings.

## **Applications**

1. The versatility of this machine allows it to transport a wide range of materials, making it suitable for various applications.
2. In addition to warehouses, this machine finds utility in cargo plants, airports, railway junctions, and other environments where efficient material handling is essential.
3. The machine's usage extends beyond warehouses, as it plays a vital role in industries such as manufacturing and the automobile sector. It facilitates the transportation of raw materials, semi-finished products, finished goods, and packaged cargo within these industries.
4. With minor modifications, this machine can be adapted for diverse purposes. It can be employed in snow plowing operations, dockyards, recycling facilities, and construction sites, showcasing its adaptability and versatility in various settings.

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## **Advantages**

1. This machine simplifies the loading and unloading process, streamlining material handling operations with its efficient design and capabilities.
2. In comparison to existing machines, this machine demonstrates superior speed and efficiency, allowing for faster completion of material handling tasks.
3. Safety is a paramount consideration when it comes to material handling. This machine prioritizes worker safety, implementing features and mechanisms that reduce the risk of accidents or injuries during operations.
4. Maintenance of this machine is hassle-free and straightforward, minimizing downtime and ensuring smooth and continuous operations.

5. The cost-effectiveness of this machine is a key advantage. Its efficient performance, durability, and low maintenance requirements contribute to reduced operational costs and enhanced overall affordability.

6. The machine's design allows for easy attachment and detachment of additional components or accessories, enabling customization and adaptability to specific tasks or environments.

7. Beyond its application in warehouses and cargo plants, this machine serves as an excellent solution for industrial goods transport. It can handle the movement of heavy and bulky items within industrial settings, contributing to increased operational efficiency.

**. Methodology (Architecture):** Traditionally, research efforts in the field of forklifts have primarily focused on enhancing efficiency and technical capabilities. These endeavors have resulted in significant advancements, including the introduction of narrow aisle applications, improved engine efficiency, and better access for maintenance purposes. Manufacturers have also incorporated ergonomic considerations into the development process to address the well-being of operators. The primary objective of these ergonomic considerations is to minimize the effects of whole-body vibration and static muscle loads, ensuring a safer and more comfortable working environment.

Regardless of the specific project or development, the process is typically divided into several stages, each with its own objectives and requirements. These stages include initiation, analytics, design, programming, testing, and deployment. It is important to note that progress from one stage to another is contingent upon the completion of the

preceding step. This sequential progression is often referred to as the linear sequence app development life cycle model.

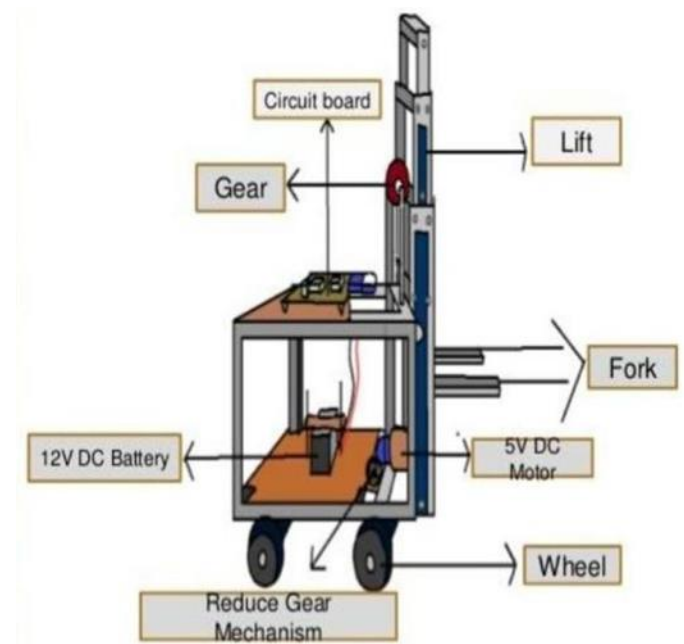


Fig. 1. Methodology



## WORKING PRINCIPLE

The wheel shaft of the forklift is connected to an arrangement that includes a motor responsible for propelling the vehicle. The motor operates using power from a connected battery. To increase torque,

the motor is coupled with a worm gear and directly connected to the wheels through a bearing block, ensuring smooth movement of the vehicle. The control unit regulates the motor's functioning.

One notable advantage of this forklift is its environmentally-friendly nature, as it produces no pollution during operation. Positioned at the front of the vehicle is the forklift arrangement, which utilizes a lead screw mechanism for lifting and lowering the fork. This mechanism enables precise vertical movement as needed.

Safety is a paramount consideration in forklift design, particularly during loading and movement. The stability system comprises three points of contact, with two front wheel drives and a rear wheel contact axle arranged securely. These elements ensure the stability of the forklift during operation

Various components are utilized in the material handling system of this forklift, including the wheel hub, wheel axle, supporting frame, handle rods, vehicle motor, chain and sprockets, Raspberry Pi (a microcontroller platform), lifter motor, lifter sliders, supporting rods, screwing mechanism, tires, wires, mounts, fixtures, screws, switches, and supporting frame.

## Conclusion

The primary objective of this project is to address the challenges faced in warehouses when it comes to carrying lighter loads using traditional forklifts. By introducing the concept of a two-wheel aisle forklift, the aim is to enhance efficiency and reduce accidents that often occur due to the use of larger forklifts.

The design of the two-wheel aisle forklift revolves around the core idea of improving work efficiency and minimizing power consumption. Its smaller dimensions allow for easy maneuverability in narrow spaces within warehouses, enabling efficient movement without compromising on safety. The emphasis on high safety factors ensures a secure working environment for operators and reduces the risk of accidents.

Furthermore, the implementation of the two-wheel aisle forklift leads to significant time savings in warehouse operations. Its optimized design and features streamline the load-carrying process, contributing to overall productivity and operational effectiveness.

By addressing specific challenges in warehouses and highlighting the unique features of the two-wheel aisle forklift, the project aims to provide an efficient, safe, and time-saving solution for material handling in warehouse environments

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