

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 2, March 2025

# Design and Fabrication of Vehicle Moving Skate Wheel Dolly

Nikhil K Kamble<sup>1</sup>, Shubham G Chandankar<sup>2</sup>, Shrikrishna S Kalekar<sup>3</sup>, Pavan S Devkule<sup>4</sup>,

Prof. Nilesh Kokare<sup>5</sup>

Students, Department of Mechanical Engineering<sup>1234</sup> Lecturer, Department of Mechanical Engineering<sup>5</sup> Zeal Polytechnic, Pune, Maharashtra, India

Abstract: This project endeavours to design, develop, and deploy a cutting-edge Car Van Vehicle Moving Skate Wheel Dolly Jack Trolley, revolutionizing the efficiency, safety, and cost-effectiveness of vehicle movement and storage. By integrating advanced skate wheel technology and hydraulic jack systems, the trolley will facilitate effortless smooth movement significantly reducing labour requirements and minimizing the risk of vehicle damage. Additionally, the trolley's optimized design will maximize space utilization, enabling businesses to streamline their operations and increase storage capacity. Through rigorous design, development, and testing phases, this project will deliver a robust, reliable, and userfriendly Car Van Vehicle Moving Skate Wheel Dolly Jack Trolley, poised to transform the vehicle movement and storage landscape.

Keywords: Vehicle Dolly Skate Wheel Dolly Material Handling Vehicle Lifting System Mechanical Design

# I. INTRODUCTION

The movement of vehicles in confined spaces, such as workshops, garages, and assembly lines, presents significant challenges. This paper explores the design and fabrication of a skate wheel dolly, a mechanical device that facilitates the movement of vehicles with minimal effort. The study focuses on the selection of materials, structural design, and load-bearing capacity, ensuring efficiency and durability. The proposed dolly design incorporates a robust frame, high-load capacity skate wheels, and ergonomic handling mechanisms to enhance usability. This research aims to provide an efficient and cost-effective solution for vehicle repositioning, reducing manual effort and operational time.

Vehicle movement within confined areas often requires specialized equipment to avoid excessive labor and potential vehicle damage. Traditional jacks and lifting mechanisms require substantial effort and may not be suitable for frequent relocations. The skate wheel dolly provides a viable alternative by allowing omnidirectional movement of the vehicle with minimal resistance.

The objective of this study is to design and fabricate a vehicle moving skate wheel dolly that is lightweight, durable, and capable of handling significant loads. The design integrates ergonomic considerations and ensures ease of use for various vehicle types, from motorcycles to cars.

# **II. LITERATURE REVIEW**

This section presents a review of existing research on car van vehicle moving skate wheel dolly jack trolley systems. Several studies have been conducted to optimize the design, weight, and material of trolleys to enhance their efficiency and functionality.

Ramkumar R. and Krishnaraju A. (2016) explored the optimization of material handling trolleys using finite element analysis (FEA). Their study focused on reducing the weight of trolleys used in the automotive industry, particularly for car body and panel transportation. By utilizing CREO and ANSYS, they analyzed the impact of different materials and mass reduction strategies. The study found that a 15 mm thickness with pad and mild steel material provided the best performance in terms of strength and weight reduction [1].

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Maher Ali Hussein et al. (2013) examined the issues related to low load-carrying capacity in office trolleys. They proposed a modified design with enhanced load efficiency and reduced weight. Their simulations demonstrated that an alloy steel (stainless steel) office trolley offered the best results, with a higher load capacity, lighter weight, and improved safety factor compared to conventional designs [2].

Syed Sajid Ahmad Syed Nisar, K. I. Ahmad, and M. Sohail Pervez (2016) investigated industrial metal pallets used in forklift trucks. Their research involved analyzing existing pallet designs and modifying them to reduce weight and cost. The modified design was validated through simulations, confirming its ability to withstand design loads while achieving material and cost efficiency [3].

Abdullah Waseem, Ahmad Nawaz, Nauman Munir, Bilal Islam, and Sahar Noor conducted research on the use of PVC materials in trolley design. Their study demonstrated that PVC exhibits minimal deflection under loads of up to 45 kN (45000 N). The findings suggested that PVC is a viable material for trolleys due to its high tensile strength, recyclability, and suitability for mass production [4].

Bhavin J. Shah, Virag A. Timbadia, Rahul Bhat, Dhruvi N. Panchal, and Karan Dave (2017) designed a multipurpose trolley that can be used at airports and shopping malls. They selected stainless steel (SS 202) for the trolley frame and polyurethane (PU) for the wheels. Their design was found to be rigid, robust, and easy to handle, with a high load-carrying capacity [5].

#### **III. METHODOLOGY**

The design and fabrication of the skate wheel dolly follow a structured approach:

#### **Requirement Analysis**

This phase involves identifying key factors such as the maximum weight the dolly must support, wheel specifications for smooth movement, and structural considerations to ensure durability. The objective is to determine the necessary load-bearing capacity and ergonomic design elements for ease of operation.

#### **Material Selection**

Choosing the appropriate materials is critical for balancing strength and weight. Mild steel is considered for its high strength, while aluminum is an alternative for a lightweight structure. The skate wheels are selected based on load capacity, traction, and resistance to wear and tear.

#### **Design and Simulation**

Computer-Aided Design (CAD) software is used to create a detailed model of the dolly. Simulations are performed to optimize the dimensions, wheel placement, and structural integrity. Finite Element Analysis (FEA) is used to evaluate stress distribution and ensure the dolly can withstand various loads without failure.

#### **Fabrication Process**

The manufacturing process includes:

- Cutting: Using CNC machining or laser cutting to achieve precise dimensions.
- Welding: Joining metal components to form a strong frame.
- Assembly: Attaching wheels, handles, and locking mechanisms to the frame.
- Surface Treatment: Applying coatings to prevent corrosion and improve durability.

#### **Performance Testing**

Once fabricated, the dolly undergoes rigorous testing, including:

- Load Testing: Evaluating maximum weight capacity and structural integrity.
- Maneuverability Testing: Assessing ease of movement and turning capabilities.
- Durability Testing: Checking resistance to wear and operational longevity under repeated use.

These steps ensure that the final product meets functional and safety standards before implementation.



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# **Design Considerations**

The primary components of the skate wheel dolly include:

- Frame: Constructed using mild steel or aluminum alloy to ensure strength and lightweight properties.
- Skate Wheels: High-load capacity polyurethane wheels with ball bearings for smooth movement.
- Locking Mechanism: Braking system to secure the dolly in a stationary position.
- Lifting Mechanism: A simple ramp or hydraulic lift to elevate the vehicle onto the dolly.

## **IV. FABRICATION PROCESS**

#### **Finalized Dimensions for the Frame**

The following dimensions have been selected for the skate wheel dolly frame to ensure durability and optimal loadbearing capacity:

- 50×50×2 mm square tube Primary structural support
- $40 \times 40 \times 2$  mm square tube Secondary reinforcement
- 20 mm round bar Axle and support components
- 75 mm ID, 20 mm OD, 25 mm thick wheel Load-bearing wheels for smooth movement
- 2 mm thick sheet Base and support elements

## The fabrication involves:

- Frame Construction: Cutting and welding metal sheets to create a rigid frame.
- Wheel Assembly: Attaching skate wheels at strategic positions for uniform load distribution.
- Surface Finishing: Applying anti-corrosion coatings for durability.
- Load Testing: Ensuring the dolly can support various vehicle weights effectively.



Fig no :1Fabricated Skate Wheel Dolly

# V. MANUFACTURING OR DEVELOPMENT

1000kg Weight Capacity – This wheel dolly could lift wheel weight to 1000kg, It is a simple but efficient method of moving a disabled vehicle around a shop environment and it is ideal for effortless movement of wheels and vehicles. Durable and Strong Construction – Made from high-quality steel, this wheel dolly could easily hold wheels or vehicles

& is not easy to be out of shape.

Universal Wheels – Wheel dolly could be applied at any position for the universal wheels. These wheels make transportation easier.

Perfect for Most Cars and Light Vans – This wheel dolly is fitful to tires up to 16 inches wide. So it could be in common use in most cars and light vans. You could just put it in the trunk and use it at anytime and anywhere for most vehicles.



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Fig. 2. Testing of Skate Wheel Dolly

Fig. 3. Testing of Skate Wheel Dolly

# VI. APPLICATIONS

The manufactured skate wheel dolly has a wide range of applications across various industries:

- Automotive Industry: Used in car dealerships, repair shops, and garages for vehicle movement and maintenance.
- Vehicle Storage Facilities: Assists in managing vehicles in parking garages, storage units, and impound lots.
- **Transportation and Logistics**: Helps trucking companies, shipping ports, and airports maneuver vehicles efficiently.
- Manufacturing and Assembly Plants: Aids in moving vehicles along production lines and quality control areas.
- Event Management: Used for positioning vehicles in car shows, exhibitions, and trade shows.
- Parking Garages and Lots: Ensures efficient parking and retrieval of vehicles in crowded spaces.
- Military and Government: Supports vehicle maintenance and storage operations in military and government facilities.
- Rental Car Companies: Improves efficiency in moving and organizing rental vehicle fleets.

# VII. CONCLUSION

The vehicle moving skate wheel dolly offers a cost-effective, efficient, and user-friendly solution for vehicle repositioning. Its lightweight yet sturdy construction makes it suitable for workshops, garages, and vehicle maintenance centers. Future enhancements may include motorized movement assistance and adjustable wheel mechanisms for varied terrain adaptability.

The Design and Fabrication of a Vehicle Moving Skate Wheel Dolly offers an innovative and effective solution for maneuvering vehicles in restricted spaces, enhancing both efficiency and safety in environments such as garages, workshops, and service stations. Through careful design, material selection, and precision fabrication, the dolly ensures smooth and easy movement of heavy vehicles without the need for complex lifting systems or external power sources.

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