

Design and Fabrication of Modern Floor Crane with Forklift Functionality

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Abstract

Material handling is an important aspect in industries and workshops. Conventional lifting equipment such as cranes and forklifts are generally large and expensive. This project focuses on the design and fabrication of a modern floor crane with forklift functionality that can lift and move loads efficiently in small workshops and industries. The developed system combines crane lifting capability with forklift support using a compact mild steel structure and a hydraulic jack mechanism. The fabricated model demonstrates improved mobility, lower cost, and easy operation

Keywords: Hacksaw, Scotch Yock Mechanism, Motor, Handle.

1. INTRODUCTION

Material handling is a crucial operation in industries, workshops, and warehouses, involving the lifting and transportation of materials. Conventional equipment such as cranes and forklifts are widely used for this purpose, but they are often expensive, bulky, and require large operating spaces. This makes them less suitable for small-scale industries and workshops where cost, space, and ease of operation are important factors.

To overcome these limitations, this project focuses on the design and fabrication of a modern floor crane with forklift functionality. The system combines the lifting capability of a crane with the load-carrying ability of a forklift in a single compact unit. It is designed using a mild steel structure and a hydraulic jack mechanism to lift loads efficiently with minimal effort.

The developed model is capable of handling loads up to **100 kg**, making it suitable for small workshops and light industrial applications. This combination of crane and forklift functions provides a cost-effective, portable, and easy-to-operate solution for modern material handling needs.

So, it is impossible to depend upon Conventional single frame power (electric) hacksaw machine and need to Improvement in technology and design of such machines

2. PROBLEM STATEMENT

Selecting a Template

In small-scale industries and workshops, handling heavy materials is often difficult due to the lack of suitable equipment. Conventional machines like cranes and forklifts are costly, bulky, and require large space and skilled operators, making them impractical for small applications. As a result, manual handling increases labor effort, time consumption, and safety risks. Therefore, there is a need to develop a compact, cost-effective, and easy-to-operate system that

can both lift and transport loads efficiently, which leads to the design and fabrication of a modern floor crane with forklift functionality capable of handling up to 100 kg.

3. OBJECTIVE

The main objective of this project is to design and fabricate a modern floor crane integrated with forklift functionality to improve material handling efficiency. The system is developed to be compact, portable, and suitable for small workshops where space and cost are major constraints. It aims to reduce manual effort by using a hydraulic lifting mechanism and ensure safe handling of loads up to **100 kg**. Additionally, the project focuses on providing a cost-effective and easy-to-operate solution that combines lifting and transportation in a single unit, thereby increasing productivity and reducing time required for material handling operations.

• Applications

1. Used in **small-scale industries** for lifting and moving materials.
2. Applicable in **warehouses** for short-distance material transportation.
3. Suitable for **construction sites** for light material handling tasks.
4. Helpful in **industrial training institutes and labs** for demonstration purposes.
5. Useful in **automobile workshops and garages** for handling engine parts and heavy components.
6. Used in **maintenance and repair work** where lifting equipment compact is required.

4. DESIGN METHODOLOGY

The design methodology of the modern floor crane with forklift functionality involves developing a compact and efficient system by combining crane and forklift mechanisms into a single unit. Mild steel is selected as the primary material due to its strength and durability, and the structure includes a base frame, vertical support, lifting arm, and fork attachment. A hydraulic jack is used to provide the lifting force, allowing loads up to **100 kg** to be raised with minimal effort, while wheels are incorporated for easy mobility. The design also considers important factors such as load distribution, stability, and safety to ensure reliable and efficient operation in small workshops and industrial applications.

4.1 Methodology Design and Fabrication:

The methodology adopted for the design and fabrication of the modern floor crane with forklift facility involves the following steps: requirement analysis to lift up to 100 kg weights in small-scale industries, the development of a compact and portable conceptual design to ensure ease of operation and efficiency, the selection of the structural material, i.e., mild steel, which is both strong and cost-effective, carrying out basic design calculations to ensure safety, the selection of the lifting device, i.e., the manual hydraulic jack, and finally the testing of the equipment to ensure stability, performance, and safety.

4.2 Time Taken to lift the Material:

The time required for lifting the material using the proposed design for the floor crane depends on various factors such as the weight of the load, the efficiency of the lifting mechanism, and the effort applied by the operator. In the case where the load weighs less than 100 kg, the time required for lifting the load is between 15 to 25 seconds. This is under normal conditions where the operator manually applies the required effort to the lifting mechanism to gradually lift the

boom and the load. The time may slightly vary depending on the strokes and the height to which the load is lifted.

4.3 Power Consumption:

The developed floor crane operates on a manual mechanism and does not require any external electrical power source. The lifting operation is performed through human effort, making the system energy-efficient and suitable for small-scale applications.

4.4 Efficiency Improvement:

The developed design of the floor crane increases efficiency since the lifting and transportation functions are integrated, thereby saving time and labor for material handling. The design is also portable, which increases convenience, especially for use in confined spaces. The use of a manual lifting system also increases efficiency since it reduces the chances of material handling errors, thus promoting safety. Furthermore, the design reduces the need for multiple equipment and labor, thereby promoting increased productivity in small-scale industries. Overall, the design is efficient and cost-effective for handling loads up to 100 kg with minimal labor and time

4.5 Cost Difference:

The cost difference between the traditional and Floor crane with Forklift is Rs.2,000. indicating a Higher initial investment for the Floor crane with Forklift. However, this cost may be offset by the benefits in efficiency and productivity over time.

4.6 Manpower Savings:

With the Floor crane with Forklift, there is a manpower savings of Rs.150 per hour compared to the traditional machine. This is due to the reduced need for operators, contributing to cost savings in labor.

4.7 Liver Mechanism:

It mainly functions on the basis of the principle of the lever mechanism, where the input force is increased to lift the load by means of the boom, which is pivoted. The lifting action of the load is achieved by means of the pressure-based mechanism.



Fig.2 Dimensional Details of Design And Fabrication of Modern Floor Crane with Forklift Functionality

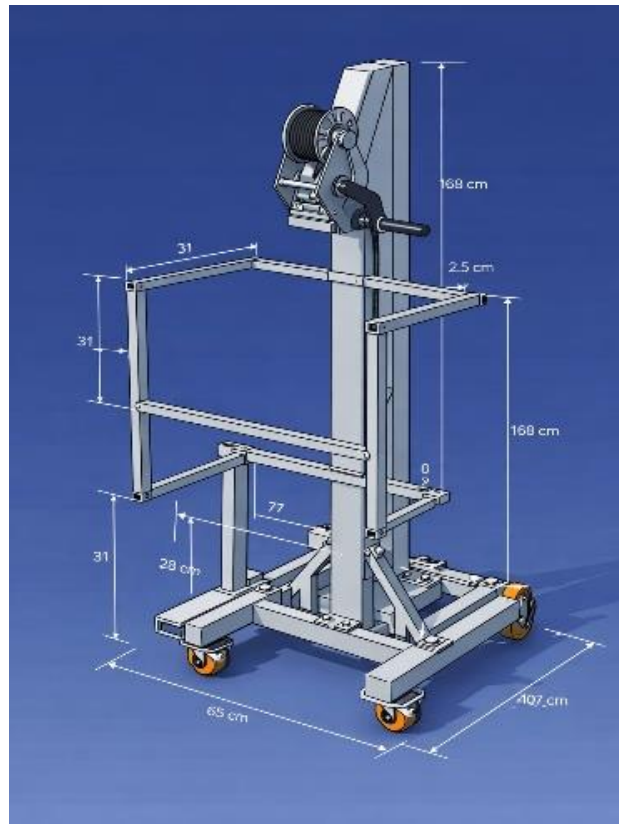


Fig.3 3D Model of Design and Fabrication of Modern Floor Crane with Forklift Functionality
Comparative Study

TABLE I

COMPARATIVE STUDY OF TRADITIONAL METHOD AND PROPOSED SYSTEM

Comparative Study	Traditional Manual Handling	Proposed Floor Crane with Forklift
Time Taken to Lift Load (sec)	60–90	15–25
Power Consumption	Manual (High Effort)	Manual (Reduced Effort)
Load Capacity (kg)	Up to 50	Up to 100
Material Handling Rate (loads/hour)	20–30	50–60
Efficiency Improvement	N/A	60–70%
Cost (Rs)	Low	3000–5000
Manpower Requirement	2 Persons	1 Person
Manpower Savings (Rs/hour)	N/A	100–150
Safety	Low	Improved
Manpower Requirement	2 Persons	1 Person
Safety	Low	100–150
Portability	Limited	High

5. CONCLUSION

The modern floor crane that has been designed and developed to incorporate forklift features has successfully met the objective of providing a cost-effective and efficient solution for small-scale applications. The modern floor crane has the capability to lift and transport materials up to 100 kg using reduced manpower and increased control. The single-unit approach to lifting and moving the crane has increased its productivity and reduced the time taken to perform the task. Hence proved effective.

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