

Prototype Design and Research Collection

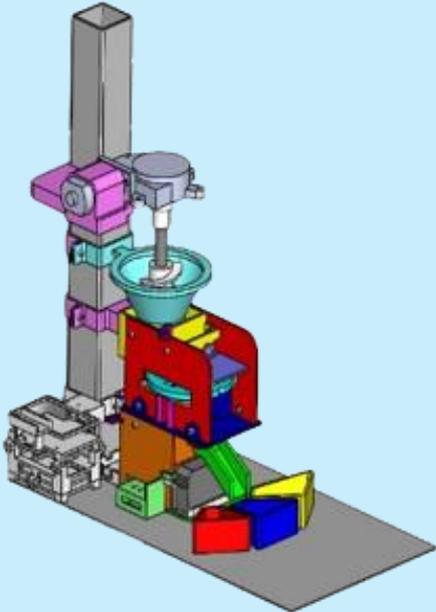
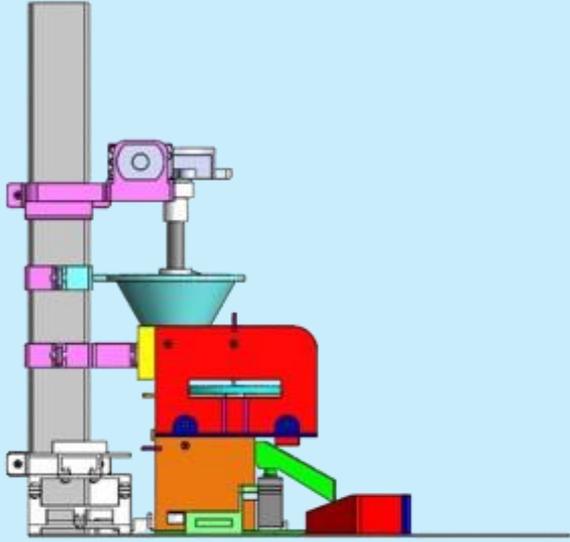
Series 1



Universiti Teknologi MARA
Pasar Gudang Campus

Prototype Design and Research Collection

Series 1



AHMAD NAJMIE RUSLI

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FOREWORD

This digital book on Prototype Design and Research Collection Series 1 (PDRC Series 1), is designed as a comprehensive reference for mechanical engineering students. The designs featured in this collection undergo an extensive analysis process, incorporating both prototype development and research to ensure a thorough understanding of design principles. Each project is carefully analysed before the prototype fabrication with detailed summaries of the project description and design parameters. The design and research products presented in this series cover a wide range of tools and equipment for various applications including household, workshop and entrepreneurial purposes.

This collection aims to foster innovation by offering students valuable insights into both the technical and research aspects of product design. It is hoped that this book will inspire future engineers and designers to approach product development with a deeper understanding of the design and research processes.

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CHAPTER 10

Development of Adjustable Table Lifter Transport Using Hydraulic Jack

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ABSTRACT

This project is presenting a piece of equipment or a system that uses hydraulic jacks to lift and transport heavy objects or materials, and the adjustable aspect allows you to control the height or position of the lifted load. It is expected to simply move the furniture and heavy appliances from one location to another, allowing to rearrange the furniture. After that, the design of this project also included additional features using hydraulic jacks, it can precisely adjust the height or position of the lifted load. This project discusses about the expected to be easy to maneuver easily, comfortable to use and safer and more secure. In conclusion based on the developed system, authors discussed the advantages and points need to be considered when working on the system.

Keywords: Transport heavy objects, Hydraulic jacks

1 INTRODUCTION

Nowadays, a heavy object is an item or an entity that is notably heavier than what can be easily lifted, moved, or manipulated by human strength alone. Roughly 21% of workplace injuries are directly linked to manual handling tasks, such as the lifting, carrying, or movement of objects [1]. These incidents are frequently exacerbated by improper lifting methods and insufficient ergonomic practices. It's imperative for consumers to make the safety of manual handling procedures a top priority and to prevent injuries resulting from manual handling.

Next, many claims that the difficulty of carrying heavy object, even with two people, is due to its weight. People's laziness in moving this bulky object for cleaning and interior design will be well-spent. Regarding this issue, it is challenging to carry that heavy furniture to a specific place. To help get along with people with their moving problems, we need a mechanism that can move a heavy object to the place where I need it by myself.

So, our current solution is to create a mechanism that can move the bulky goods quickly and is simple to use without using an effective tool or even needing manpower. However, when moving any load, there is always chance of problem such as the risk of loads slipping on smooth surfaces, suitability only for flat terrain, challenges with maneuvering around corners, limited load capacity, instability in heavy-duty tasks, and a requirement for substantial force to push or pull the trolley [2].

This project aims to fabricate the designed adjustable lifter transport as a proof of concept that could be replaced or function as an alternative for lifter transport by using hydraulic jacks to lift and transport heavy objects or materials, and the adjustable aspect allows

you to control the height or position of the lifted load. This model's main benefit is that it makes carrying heavier furniture less difficult for people using it.

Moving on to the next point which is the significance of this study from this project that it helps make the process of moving heavy objects easier and more efficient, especially for individuals who may need access to professional movers or sufficient physical strength to lift heavy items on their own. After that, the versatile design makes the heavy objects lifter transport can easily move such as household items, bookshelves, and so on. This quality can also significantly reduce physical strain and make the process more manageable for individuals[4].

2 LITERATURE REVIEW



Fig. 1: Handling Trolley Hydraulic Table Truck

Figure 1 shows a typical handling trolley heavy duty lift hydraulic table truck. These widely used nowadays cause this transport strong enough to deal with items up to 150 kg. It's important to check the weight capacity of the furniture transport and ensure that it is suitable for the specific furniture. This product contains a wheeled lifter and 4 wheels corner movers that can help move any piece of furniture in their own home. Another factor to consider is the product designed with hydraulic scissor lift jack that can be easy to control cargo and table and can get as far as the desired platform height. The market price is also high and not suitable appropriate for everyone to purchase one.



Fig. 2: Metal Lift Table

Figure 2 shows a well-known that combining special handling systems and ergonomic design allows this tool to lift heavy objects effortlessly. The lift table is constructed with knob which it can be adjusted the height of objects by knob. The high-grade material from stainless steel is high hardness and resistant to rust or even corrosion, while it also capable of withstanding heavy use and loads. The products generally require less maintenance compared to lifts made from other materials.



Fig. 3 Furniture Lifter kit Lifting Moving Slider

Figure 3 shows this furniture lifter tool incorporates an ergonomic and labor-saving design, allowing them to move their furniture effortlessly using their physical strength[5]. The ergonomic design ensures it can lift and transport heavy furniture and appliances without straining back. Effortlessly lift furniture with just one hand. The four roller pads are in the four corners of the furniture. It can bear a weight of up to 100 KG, enabling it to move furniture or heavy objects easily.

3 METHODOLOGY

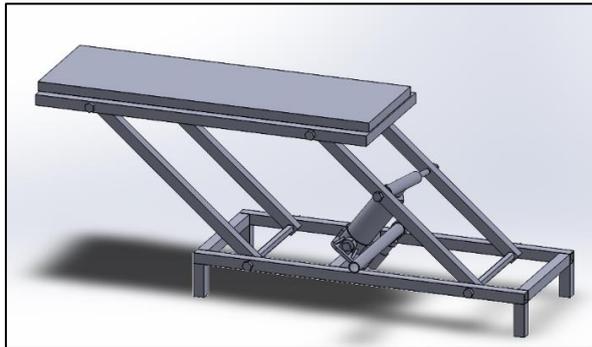


Fig. 4.1: Design model



Fig. 4.2: Final prototype

The design seen in Figure 4.1 was created using the SolidWorks, whereas Figure 4.2 represents the completed prototype. The final prototype predominantly used two types of steel, namely mild steel, and stainless steel. The stainless-steel material is utilized for components that require exceptional resistance to substantial forces.

Table 1: Prototype Final Specification

Types	Specification
Frame	Mild Steel Square Hollow
Power Source	Hydraulic Jack
Material	1. Mild Steel (frame) 2. Stainless steel (bolt) 3. Pine wood (base)
Market price	RM250
Basic Function	Lifting the heavy items
Dimension	600 mm x 200 mm x 400 mm

4 RESULTS AND DISCUSSION

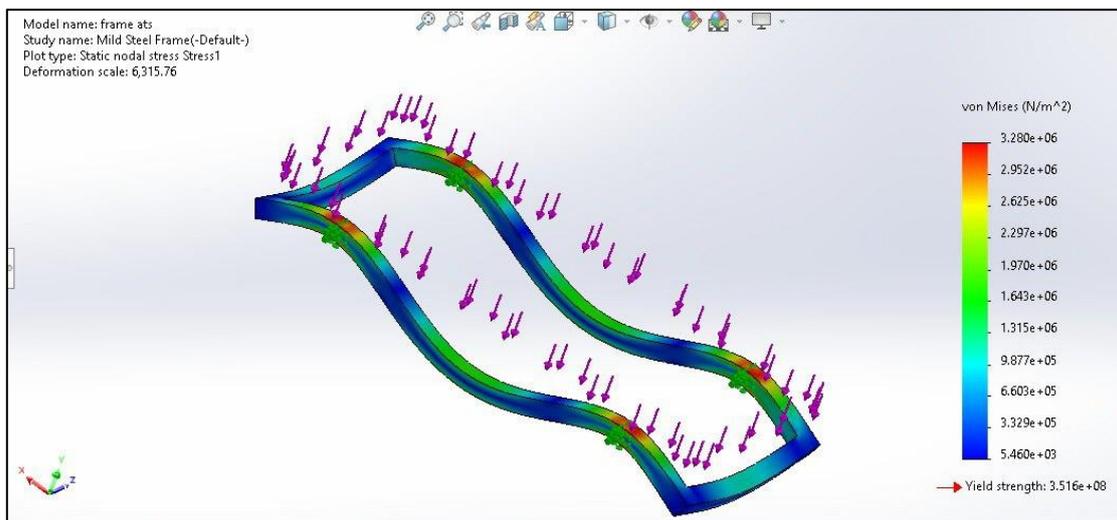


Fig. 5: Von Mises Stress Diagram

Based on the project's calculations, the applied force is about 500N on the frame when lifting the load. The maximum stress which $3.280+06 \text{ Nm/m}^2$ is lower than the yield strength $3.516+e08 \text{ Nm/m}^2$. Consequently, this design is deemed safe for consumer usage, however its weight capacity is restricted and varies according to different applications and situations.

5 CONCLUSIONS

The objective aim of the project was to create the prototype. The assigned assignment was challenging to complete due to insufficient feedback on the desired design. The design process was hindered by a lack of proficiency in utilising the SolidWorks programme. In addition, it is necessary to cross-reference the study conducted on the machine with the product that is now accessible. Primarily, the inspiration was derived from conventional tables. The prototype underwent many iterations to get its ultimate design. The ultimate design successfully rectifies the shortcomings of the first concept. They have features such as adjustable height, high load-bearing capacity, and stability, which make them suited for a diverse array of jobs. Nevertheless, it is crucial to contemplate the benefits and drawbacks of hydraulic tables, together with their sustainability and upkeep prerequisites.

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