

# CHAPTER – 1

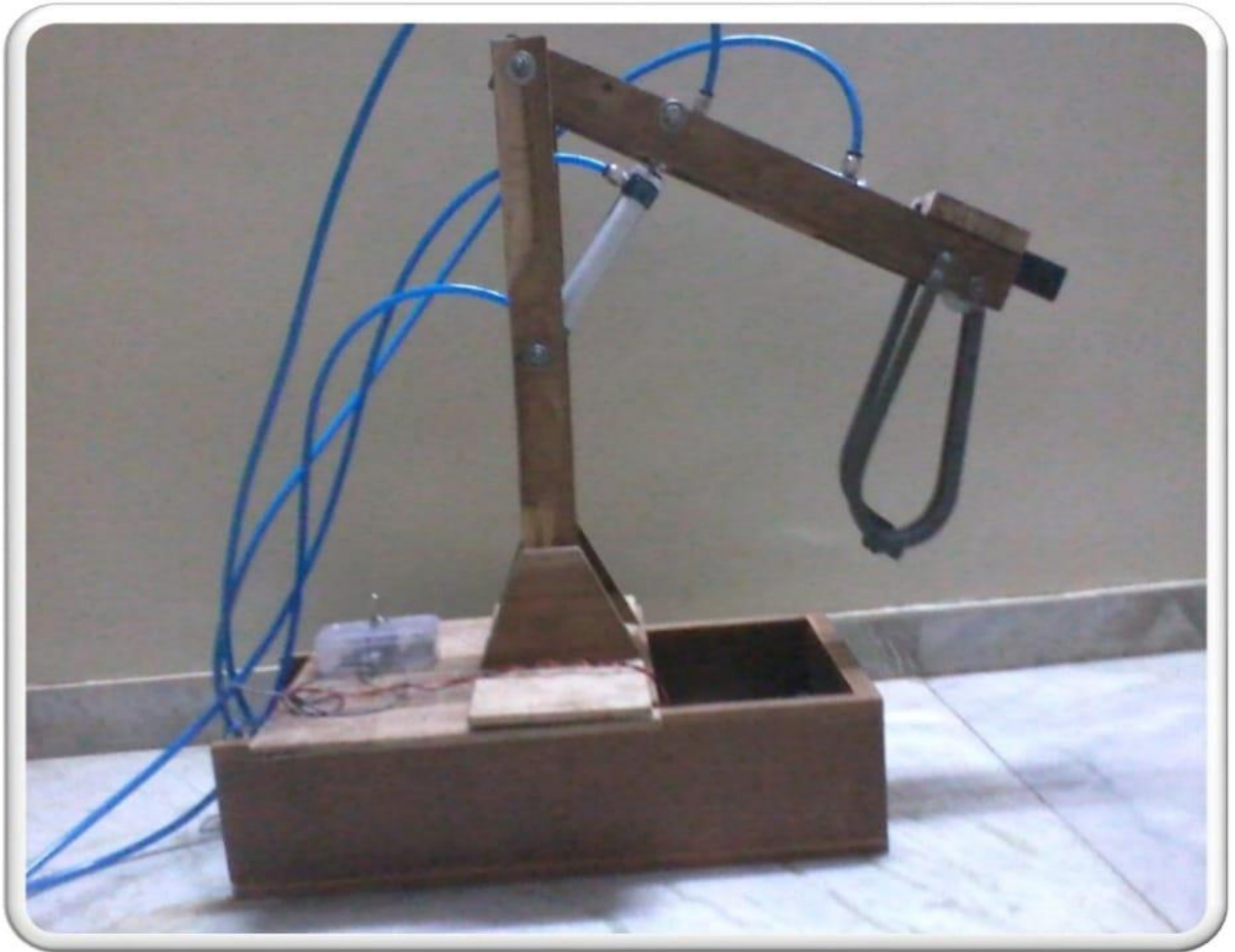
## INTRODUCTION

Hydraulic lifting machines are widely used for the lifting, moving and pushing function in mining, construction and steel industries and in material handling equipment. Since 1950s the applications of hydraulic systems have been started in the industries and this form of power has become standard for the operations of industrial equipment. Today, modern automation technology has a very important place for hydraulic systems. The reason for this is that hydraulic systems are simple, versatile and efficient for the transmission of power. The main job of a hydraulic system is the transmission the power as the power is changed from one form to another. As these hydraulic systems are popularly used in the manufacturing and production plants, therefore it is required that they are reliable and efficient equipment to achieve the desired results from them like transmission of large amount of forces with the use of smaller components which means good power intensity and precise positioning of the equipment with consistent power output. These systems operate smoothly with reversal function possibility and can work well in high temperature environment conditions. These systems are thus cost considerably to provide the above functions and therefore the same system is modified using a simple rack and pinion mechanism to lower its cost and allowing further research and modification in it to make it able to provide all the above functions with the same efficiency.

## CHAPTER – 2

### *FUNCTION AND WORKING*

This project has sample work. Its work is to pick object or work-piece at one side and to place that object or work-piece another side.



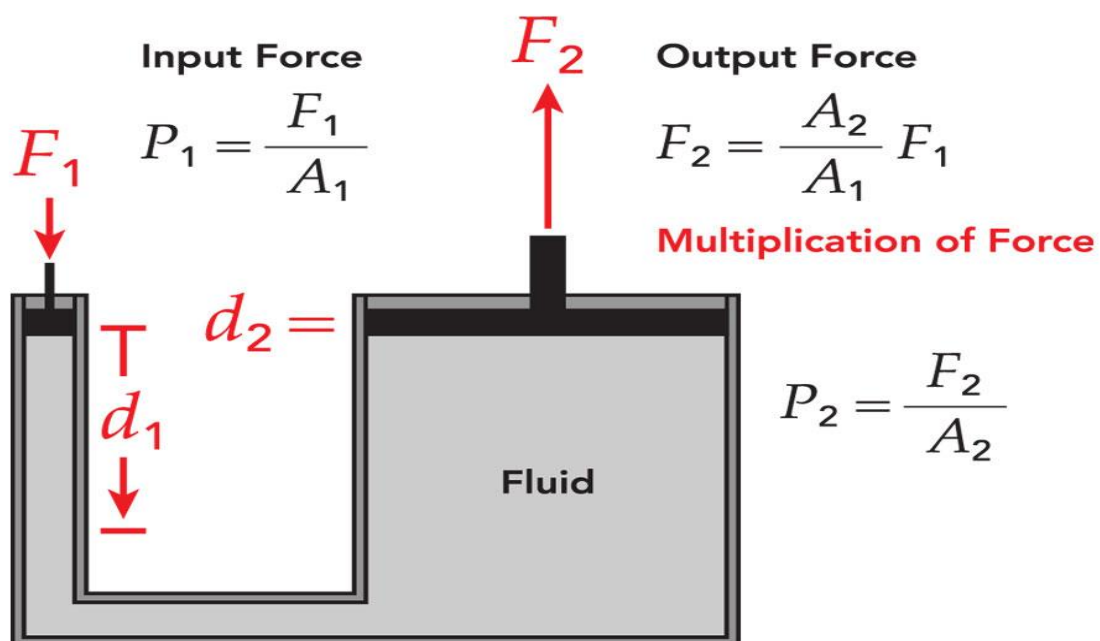
2.1 In figure showing PICK AND PLACE ROBOTIC ARM BY PNEUMATIC CONTROL.

Its working steps as under below:

1. Compressed air comes from the compressor.
2. By using lubricant controlling manual valve lubricant comes in cylinder which is located between column and arm and arm rise up by presser of cylinder's piston.
3. By losing air in cylinder which one placed in arm opens jaws by using rack and pinion mechanism.
4. Arm become down to object by losing air in cylinder.
5. Object comes between two jaws.
6. By increasing presser in cylinder jaws close and object pick in jaws.
7. Arm rise up by column's cylinder.
8. Arm become down to place object at right place by using above processes.

### Pascal theory:-

The concept of the hydraulic press is based on Pascal's theory, which states that when pressure is applied on fluids in an enclosed system, the pressure throughout the system always remains constant. In simple words, a hydraulic press is a machine that makes use of the pressure exerted on the fluids to crush something.



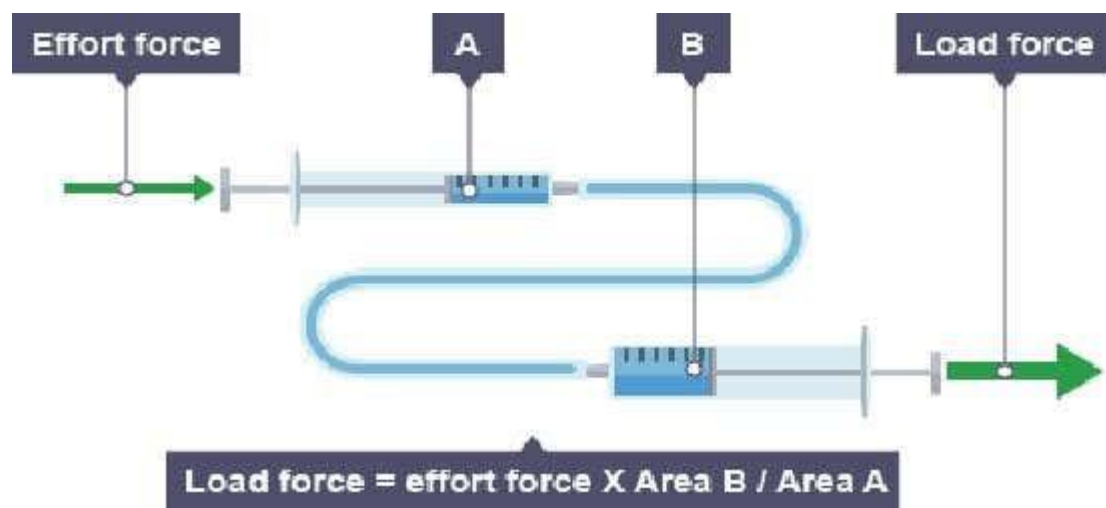
$$F_1 d_1 = F_2 d_2$$

$$d_1 = \frac{F_2}{F_1} d_2 = \frac{A_2}{A_1} d_2$$

2.2 Pascal Theory Figure

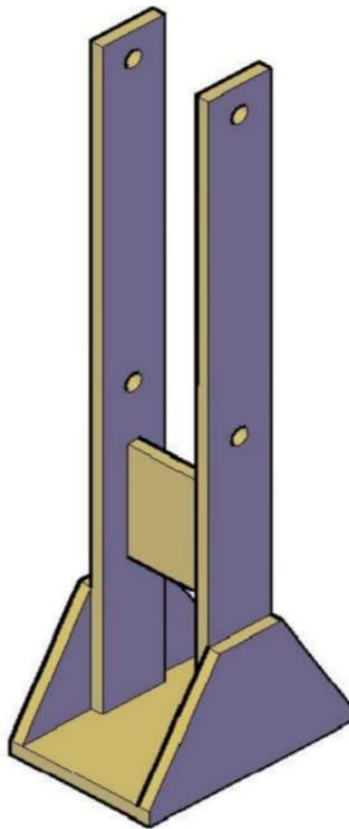
## IDEA OF IMPLEMENTATION

Now we take four 50 ml plastic syringe as hydraulic cylinder. We take one more syringe and filled it with water/oil and now we connected both syringe with plastic tube as shown below. If we pressurized one syringe second syringe lift up according to Pascal law, same phenomena work with another syringe too. Now we plan to construct this Pascal law concept as a final project.



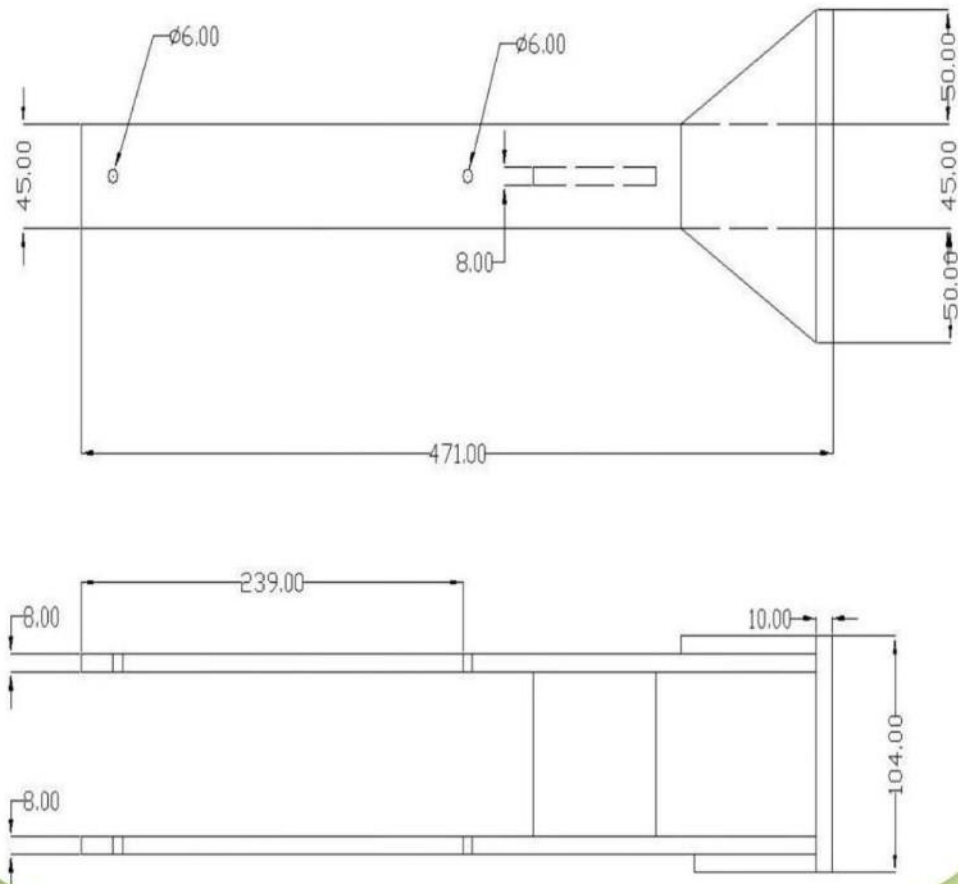
### ❖ COLUMN:-

Column is part of project which support arm to rise or to become down by using column's pneumatic cylinder. Column also cover pneumatic cylinder which helps arm rise or become down. It is made from wood. Column reset on low RPM motor which gives column rotation motion. Here is showing 3D drawing of column as below:



### **SPECIFICATION:-**

Its 2D drawing is as under below:



## 2.Parts and description of hydraulic Lift

### 1.Base

It is a plate that serves as a base or support used for carrying the overall weight of the project.

### 2. Vertical column

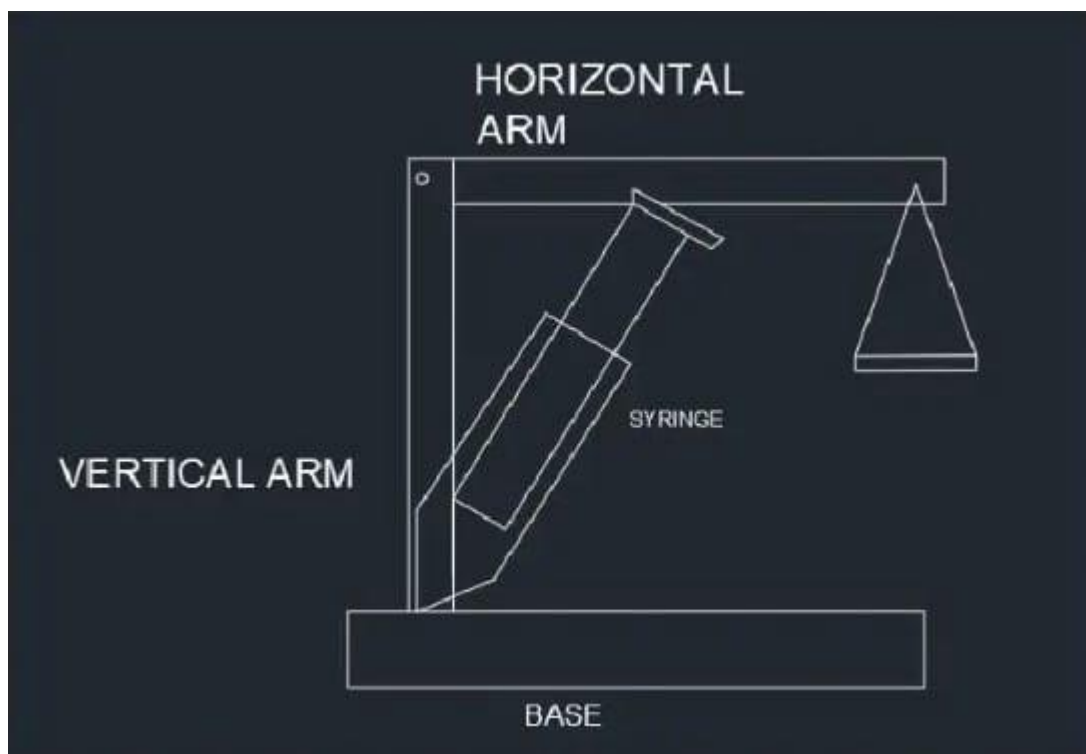
This is mounted on a pallet/base plate in Y-direction.

### 3. Horizontal arm

It is a fixed horizontal arm on which our hydraulic piston and cylinder is mounted. It is fixed with a vertical column.

### 4.Syringe

It is used as a piston to push/pull the arms.





## **2.1 Parts and descriptions of hydraulic floor Lift**

1. Base plate/ Truck/Pallet
2. Hydraulic
3. Vertical column
4. Horizontal arm
5. Hook

## **3. Design, fabrication and testing of hydraulic Lift**

In this paper, design, fabrication and testing of hydraulic Lift is intended to replace the local or traditional method of lifting heavy load with hand with emphasis being laid on performance, safety and reliability. Also, hydraulic Lift is capable of carrying load up to 1000kg at a time was developed using locally available materials. The design of the hydraulic Lift involved analysis of forces acting in various member of the Lift structure, analysis of the links mechanism, determination of pressure developed in the actuator at maximum load, material selection and cost evaluation. Its fabrication details involved some workshop operations such as marking out, cutting, machining, welding and surface treatment which was accomplished using locally available materials.

### **3.1 DESIGN CRITERIA:-**

There are three major considerations in the design of Lifts.

1. The Lift must be able to lift the weight of the load
2. The Lift must not topple
3. The Lift must not rupture.

## **4. MATERIAL SELECTION**

3.1 Selection of mild steel frames:- The material selection is also very much important because what material we are using whether it is capable of sustaining that load or not. For our project it is of medium load capacity so we are using mild steel of composition : C 15 Mn 75. The percentage of carbon varies from 0.1 to 0.2 % and this material can easily sustain the load.

3.2 Selection of wheels:- PREMIUM rubber caster wheels have a special compound of highly resilient soft rubber bonded to thick aluminum wheel centers. Unlike Conventional Mold on rubber caster wheels, PREMIUM rubber caster wheels can be moved manually when loaded to their rated capacities.

3.3 Types of contaminates:- There are many types of contaminates. The most common are: Particulate (dust, dirt, sand, fiber, rust, rubber, paint chips, metal flakes, etc.)

3.MANUFACTURING PROCESS.

## CHAPTER – 3

### **Materials Required for Making the Hydraulic Lift Model**

Before starting the project, it's important to gather the necessary materials. The main component needed for constructing the hydraulic system is a syringe. Two 20ml syringes are required, although any syringe can be used based on availability. Additionally, wooden blocks, a long wooden stick, a nut and bolt for the fulcrum, a plywood base (or cardboard), a connecting pipe, and various basic tools like markers, a cutting mat, hot melting glue, cutters, bamboo sticks, and scissors are needed. It's worth noting that a connector is required to attach the syringe and pipe, which is usually provided with medical pipes.

### **Step-by Step Guide to Making the Hydraulic Lift Model**

Once all the materials are collected, follow these step-by-step instructions to construct the hydraulic Lift:

- Create a load box and attach it to the opposite end of the long wooden stick.
- Glue one 20ml syringe to the middle of the long wooden stick, with the front side facing the bottom of the wooden blocks and the pressing side attached to the long wooden block.
- Drill holes at opposite ends of the wooden blocks, matching the radius of the bolt. Connect two short wooden blocks and one long wooden stick using a nut and bolt, ensuring that the long wooden block can rotate freely. Secure the two short blocks together using hot melting glue or an alternative adhesive.
- Create a load box and attach it to the opposite end of the long wooden stick. Glue one 20ml syringe to the middle of the long wooden stick, with the front side facing the bottom of the wooden blocks and the pressing side attached to the long wooden block.
- Use a rubber connector to connect a medical pipe to the 20ml syringe attached to the wooden block. Attach another 20ml syringe to the opposite end of the pipe.
- Your hydraulic Lift science project is now ready for a demonstration.

## **Materials Required For Hydraulic Lift Model**

- 20ml Syringes (2)
- Long Wooden Stick
- Wooden Blocks
- Nut and Bolt
- Connecting Pipe
- Marker
- Cutting Mat
- Hot Melting Glue
- Cutter
- Bamboo Sticks
- Scissors
- Rubber Connector

# CHAPTER – 4

## 4.1 Learning Science Concepts

Constructing the hydraulic Lift model allows students to learn several essential scientific concepts. Here are some of the key topics covered:

- **Pascal's Law:** Pascal's law states that when pressure is applied to a fluid within a closed container, the force is transmitted to the liquid and the container's walls.
- **Pressure:** Pressure is defined as the force applied perpendicularly to a unit area. The unit of pressure is pascal, and different types of pressure include absolute pressure, gauge pressure, and atmospheric pressure. Pressure can be calculated using the formula  $P = F/A$ .

## 4.2 Applications of Hydraulic Systems:

Hydraulic systems find numerous applications in various industries. These systems typically involve the use of a fluid in an enclosed cylinder, where force is applied to one end of the cylinder and transmitted to different forms of energy. applications include hydraulic lifts, hydraulic doors, hydraulic brakes, and hydraulic jacks.

## 4.3 Working Model of Hydraulic System: A

hydraulic system consists of a cylinder containing a fluid. When force is applied to one end of the cylinder, according to Pascal law, the pressure on the cylinder's walls increases. In our project, water under pressure flows into another syringe, causing it to move and lift the load.

# CHAPTER – 5

## 5.1 Advantages of Hydraulic Lift

There are several advantages to the hydraulic Lift science project, including:

- **Increased Work Speed:** Hydraulic Lifts enable faster completion of tasks, allowing for greater productivity in a shorter period.
- **Reduced Effort:** These machines make lifting heavy loads easier, requiring less physical effort from operators.
- **Decreased Workforce:** By utilizing hydraulic systems, companies can achieve significant work reduction, as fewer crew members are required for operation.
- **Cost Efficiency:** With a decreased workforce, the overall cost of work decreases, benefiting companies in terms of expenses.

## 5.2 Safety Tips for the Hydraulic Lift Science Fair Project

Safety should always be the top priority when conducting any science project. To ensure a safe experience, follow these guidelines:

- **Wear Safety Glasses:** Protect your eyes by wearing safety glasses throughout the project.
- **Handle Tools with Care:** Exercise caution while using DIY knives or any other sharp tools to avoid injuries.

## 5.3 CONCLUSION

We conclude that Hydraulic Lift is made with Hydraulic fluid mechanism. We can implement this concept in robotic arms, conveyor, load lifting ramps and heavy load turning table.

# ***REFERENCE***

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5. [www.edurev.in](http://www.edurev.in)