

DESIGN AND DEVELOPMENT OF AUTOMATED HYDRAULIC JACK

Submitted in partial fulfillment of the requirements for the award of Bachelor of
Engineering degree in Mechanical Engineering

By

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DEPARTMENT OF MECHANICAL ENGINEERING
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SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC | 12B Status by UGC | Approved by AICTE
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of ARISH (Reg. No. 39150008), AROKIYA SAMI (Reg. No. 39150009), who have done the Project entitled **"DESIGN AND DEVELOPMENT OF AUTOMATED HYDRAULIC JACK"** Under our supervision from December 2022 to April 2023.

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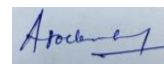
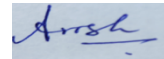
Submitted for Viva voce Examination held on 26/04/2023

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DECLARATION

We ARISH (Reg.No.. 39150008) and AROKIYA SAMI (Reg No. 39150009) hereby declare that the Project Report entitled “**DESIGN AND DEVELOPMENT OF AUTOMATED HYDRAULIC JACK**” done by us under the guidance of **Dr. G. ARUNKUMAR, ME., PhD.**, is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering in Mechanical Engineering.



DATE: 26/04/2023

SIGNATURE OF THE CANDIDATES

PLACE: CHENNAI

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ABSTRACT

The Objective of the project work is to design and develop an automated hydraulic jack system. A jack is a mechanical lifting device used to apply greater force to lift heavy loads. A mechanical jack employs a screw thread for lifting heavy equipment. A hydraulic jack uses hydraulic power. It is a tool that raises and lowers the automotive vehicle. The automated hydraulic jack will be useful to elderly people and women who find it extremely difficult to physically operate the jack during any car breakdown. Whenever the tire failure was occurred in the automotive vehicle, lifting the vehicle from ground surface is very difficult, it also involves intense human effort and it is a more time taking process. For rectifying, this kind of problem an automated hydraulic jack system helps to lift the vehicle automatically from the ground instead of conventional mechanical jack, which can save the time and excess effort. The motive behind this work is use an automated jack system which can produce more power and simpler in design as compared to a conventional design. When compared to a pneumatic system, which runs on compressible air, hydraulic systems have a greater lifting capacity since the hydraulic oil is incompressible.

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LIST OF SYMBOLS AND ABBREVIATIONS

P	Pressure Exerted by the Cylinder
F	Force of the Piston
A	Cross Sectional Area
R	Radius of Piston
π	Mathematical Symbol
Σ	Summation
L	Length of the cylinder

CHAPTER-1

INTRODUCTION

The objective of the work is to replace design and develop an automated hydraulic jack for lifting purpose in automotive vehicle. In hydraulic device, power is transmitted by pushing the confined liquid. It is a mechanical function that operated through force or liquid pressure. It is based on the principle of pascal's law. The application of hydraulic system is usually used in various fields like food industry, beverage industry, machinery industry, automotive industry, robotic arms, it can withstand and lift heavy loads.

Normally we use bottle hydraulic jack, scissor jack for lifting vehicles. The ground clearance of a car should be considered mainly during this operation. In this system they have replaced conventional hydraulic jack as inbuilt hydraulic jack and they have integrated in the vehicle. Following studies can also analyses the advantages of an integrated hydraulic jack system over a conventional mechanical jack system. By examining the design of the prototype, it is possible to see that the design of the built-in hydraulic jacks and also automated hydraulic jack is also investigated and adjusted to the necessary extent.

The built-in self-jacking component is started by pressing the designated button on the dashboard. The built-in hydraulic jack will be helpful to elderly people and ladies who find it extremely difficult to physically operate the jack during any car breakdown. This hydraulic jack will have the ability to lift the wheels in accordance with our requirements; for example, if we just need to lift two wheels, the cylinder will be moved as necessary on the rack with the help of the DC motor.

Degrees of automation are of two types, viz.

- Full automation.
- Semi automation.

In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very negligible.

NEED FOR AUTOMATION:

Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics forms an attractive medium for low-cost automation. The main advantages of all pneumatic systems are economy and simplicity. Automation plays an important role in mass production. For mass production of the product, the machining operations decide the sequence of machining. The machines designed for producing a particular product are called transfer machines. The components must be moved automatically from the bins to various machines sequentially and the final component can be placed separately for packaging. Materials can also be repeatedly transferred from the moving conveyors to the work place and vice versa. Nowadays almost all the manufacturing process is being automated in order to deliver the products at a faster rate. The manufacturing operation is being automated for the following reasons.

- To achieve mass production
- To reduce man power
- To increase the efficiency of the plant
- To reduce the work load
- To reduce the production cost
- To reduce the production time
- To reduce the material handling
- To reduce the fatigue of workers
- To achieve good product quality
- Less Maintenance

CHAPTER-2

LITERATURE SURVEY

HYDRAULIC SYSTEM

In the development of the submarine from pre-war classes, many changes and improvements have occurred. One of the outstanding differences is the large variety of submarine devices which are now operated by hydraulic power. In early classes, there was no hydraulic system, and power requirements were met by means of air or electricity. Along with constantly improving submarine design has gone a constant extension and diversification of the use of hydraulic power.

COMPARATIVE ADVANTAGES OF HYDRAULIC POWER

Hydraulic systems possess numerous advantages over other systems of power operation. They are light in weight; they are simple and extremely reliable, requiring a minimum of attention and maintenance. Hydraulic controls are sensitive, and afford precise controllability. Because of the low inertia of moving parts, they start and stop in complete obedience to the desires of the operator, and their operation is positive. Hydraulic systems are self-lubricated; consequently, there is little wear or corrosion. Their operation is not apt to be interrupted by salt spray or water. Finally, hydraulic units are relatively quiet in operation, an important consideration when detection by the enemy must be prevented. Therefore, in spite of the presence of the two power sources just described, hydraulic power makes its appearance on the submarine because of the fact that its operational advantages, when weighed against the disadvantages enumerated for electricity and air in the preceding paragraphs, fully justify the addition of this third source of power to those available in the modern submarine.

Table 2.1 Different Case Factors of Product Efficiency

FACTOR	AIR	ELECTRICITY	HYDRAULICS
Reliability	Poor	Good	Good

Weight	Light	Heavy	Light
	Simple	Simple	Simple
Control Mechanism	Valves	Switches and solenoids	Valves
Maintenance	Constant attention necessary	Difficult, requiring skilled personnel	Simple
Vulnerability	High pressure bottle dangerous; broken lines cause failure and danger to personnel and equipment	Good	Safe; broken lines cause failure
Response	Slow for both starting and stopping	Rapid starting, slow stopping	Instant starting and stopping
Controllability	Poor	Fair	Good
Quietness of Operation	Poor	Poor	Good

FAMILIARITY OF HYDRAULIC PRINCIPLES

For many centuries, man has utilized hydraulic principles to satisfy common, everyday needs, opening a faucet to fill a sink with water a practical application of hydraulics. Water moves through a dam in accordance with well-known principles of fluid motion. There are hydraulic principles that explain the action of fluids in motion and others for fluids at rest. We are chiefly concerned, however; with that branch of hydromechanics which is called simply Hydraulics and is defined in engineering textbooks as the engineering application of fluid mechanics. It includes the study of the behavior of enclosed liquids under pressure, and the harnessing of the forces existing in fluids to do some practical tasks such as steering a submarine or opening the outer door of a torpedo tube. Examples of hydraulically operated equipment are familiar to

all. Barber or dentist chairs are raised and lowered hydraulically; so is an automobile when placed on a hydraulic rack for a grease job. Stepping on the brake pedal in an automobile creates the hydraulic power which stops the rotation of the four wheels and brings the car to a halt. For an understanding of how a hydraulic system works, we must know the basic principles, or laws, of hydraulics, that is, of confined liquids under pressure.

CHAPTER-3

OBJECTIVE OF THE PROJECT

- To integrate hydraulic jack system in four-wheeler vehicle.
- To lift the car in semi-automated way.
- To patch the punctured vehicle on any circumstances.
- To reduce man power.
- To access the system at any circumstances and easy to operate.

HYDRAULIC COMPONENTS AND DESCRIPTION

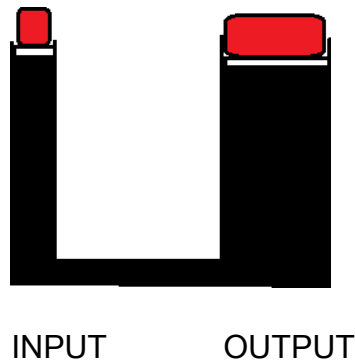


Figure 3.1 2D Model

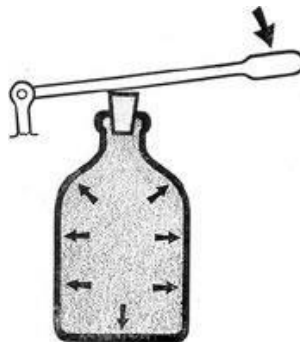


Figure 3.2 Applied pressure exerted equally in all directions

The 2D model of Automated hydraulic jack is shown in fig 3.1. A hydraulic jack is a mechanical device used to lift heavy loads. It is a device that uses specific fluids to push against piston. It works on the principle of pascal's law. It states that the pressure applies on closed fluid is transmitted and undiminished in every direction and acts with equal force and same area. In recent times the use of hydraulic system is widely spread across countries. In this system the use of oil act as a power transmission in industries. Hydraulic system is a good choice for lifting heavy machineries, it is more efficient compared to pneumatic set up machines. Pneumatic setup uses compressed air to move the piston. Usage of hydraulic machineries in industries can achieve mass production and more efficiency. There are many types of jacks like scissor jack, floor jack, highlight jack, hydraulic bottle jack. Among these hydraulic bottle jacks is portable, cheaper, easy to use.

- Liquids are practically incompressible.
- The applied pressure is transmitted equally in all directions at once.

Figure 3.2 illustrates the application of these principles to a closed hydraulic system. Two cylinders each are having a base whose area is 1 square inch, are connected by a tube. The cylinders are filled with liquid to the level shown, and a piston with a base of the same area (1 square inch) is placed on top of each column of liquid. Then a downward force of 1 pound is applied to one of the pistons. Since this piston has an area of 1 square inch, the pressure upon it is 1 pound per square inch; and since the other piston is of equal area, the same pressure, 1 pound per square inch, will be imposed upward upon it. Transmission of equal pressures to equal area is shown in Fig 3.3.

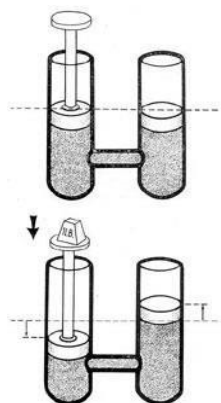


Fig 3.3 Transmission Equal pressure to Equal Area

3.1.1 MULTIPLE UNITS

It is not necessary to confine our system to a single line from the source of hydraulic power. Hydraulic power may be transmitted in many directions to do multiple jobs. Let us connect one cylinder to four others as in Figure 3.4. Here we apply a force against the piston in the large cylinder. The pressure from the large cylinder is transmitted equally to each of the pistons in the other four cylinders as shown in Fig 3.4.

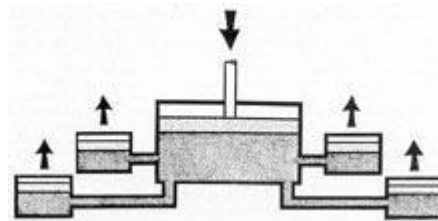


Figure 3.4 Multiple Units from a Single Source of Power

On the basis of the explanation of basic hydraulic principles just given, it is possible to construct a simple, workable hydraulic system which will operate some mechanical device. For example, such a system might open and close a door, and hold it in either position for any desired interval.

TYPES OF HYDRAULIC CYLINDER

SINGLE ACTING HYDRAULIC CYLINDER

The Single Acting hydraulic cylinder (see Figure 3.5), which is the simplest type of hydraulic motor, contains a spring-loaded piston, with a piston Rod that extends through one end of the cylinder. In our project, this single acting hydraulic cylinder is used.



Figure 3.5 Single Acting Hydraulic Cylinder

This piston rod, when connected to the door, supplies the mechanical motion which opens and closes the door. The surface of the piston in contact with the hydraulic fluid has an area of 2 square inches. The cut-out valve is hand-operated. When closed, it shuts off the line between the actuating cylinder and the supply tank, preventing the oil under pressure in the cylinder from escaping into the return line; when opened, it releases this pressure, allowing the loading spring inside the cylinder to expand, and the oil in the cylinder to escape back into the supply tank.

DOUBLE ACTING HYDRAULIC CYLINDER

In the simplified system, the door was actuated by a single acting cylinder. Oil was kept in or released from the cylinder by a simple "on-and-off" valve. For more efficient and positive actuation, this will be replaced by a double acting cylinder (see Figure 3.6). In such a cylinder, the piston can move in either direction to open or close the door.

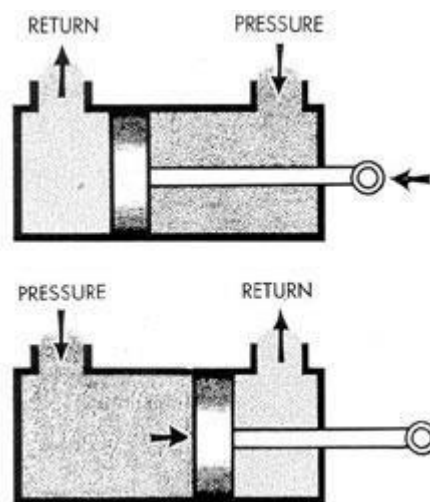


Figure 3.6 Double Acting Hydraulic System

The piston is locked in the desired position by the hydraulic fluid, which enters either side of the piston as required and remains there until forced out. Since the flow of the fluid must be directed to either of two sides, a valve, which selects the direction of flow, is installed in the line. This is called a *control valve*. Control valves vary with the specific application, but generally they are equipped with four ports. Two are connected to the actuating cylinder at either side of the piston. A third port is the pressure port and

receives fluid from the pump. The fourth port returns surplus fluid either back to the reservoir or elsewhere in the system.

THE RECIPROCATING PUMPS

The simplest practical application of this principle is seen in the hand-operated reciprocating pump, a simplified version of which is illustrated in Figure 3.7. Here the inlet and outlet ports in the cylinder, or pump body, are both in the same side of the piston. The piston makes a close sliding fit within the cylinder, reducing leakage to a minimum, since excessive leakage destroys the efficiency of a pump. Both the inlet and outlet ports are equipped with check valves which permit the liquid to flow in one direction only, as shown by the arrows.

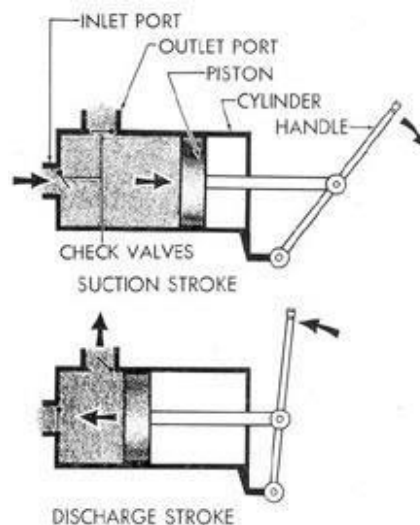


Figure 3.7 Hand-Operated Reciprocating Pump

Assume that the intake side of the pump is connected to a supply of liquid. When we move the piston to the right, lower pressure is created in the chamber formed by the piston. Higher pressure on the fluid outside the chamber forces fluid in through the inlet port and fills the chamber. Moving the handle forward in the opposite direction forces the fluid out. A check valve at the inlet port prevents flow there and, since the fluid must find an outlet somewhere, it is forced out through the discharge port. The check valve at the discharge port prevents the entrance of fluid into the pump on the

subsequent suction stroke. The back-and-forth movement of the piston in the pump is referred to as reciprocating motion and this type of pump is generally known as a reciprocating-type piston pump. It may have a single piston or be multi-pistoned. It may be hand-actuated or power-driven. The reciprocating piston principle is conceded to be the most effective for developing high fluid pressures.

CHAPTER-4

AUTOMATED HYDRAULIC JACK COMPONENTS AND DESCRIPTION

THE MAJOR COMPONENTS OF THIS PROJECT ARE

- Single acting Hydraulic Cylinder
- Oil Tank
- Hydraulic Pump with Motor
- Connector

SINGLE ACTING HYDRAULIC CYLINDER

The Single Acting hydraulic cylinder (see Figure 3.5), which is the simplest type of *hydraulic motor*, contains a spring-loaded piston, with a piston Rod that extends through one end of the cylinder. In our project, this single acting hydraulic cylinder is used.

OIL TANK

The hydraulic system requires the oil to work the system. So, we have to provide the oil tank.

HYDRAULIC FLUIDS

Almost any free-flowing liquid is suitable as a hydraulic fluid, as long as it will not chemically injure the hydraulic equipment. For example, an acid, although free-flowing, would obviously be unsuitable because it would corrode the metallic parts of the system. Water, except for its universal availability, suffers from a number of serious defects as a possible hydraulic fluid. One such defect is that it freezes at a relatively high temperature, and, in freezing, expands with tremendous force, destroying pipes and other equipment. Also, it rusts steel parts; and it is rather heavy, creating considerable amount of inertia in a system of any size. The hydraulic fluid used in submarine hydraulic systems is a light, fast-flowing lubricating oil, which does not freeze or even lose its fluidity to any marked degree even at low temperatures, and which possesses the additional advantage of lubricating the internal moving parts of the hydraulic units through which it circulates. Since this oil, a petroleum

derivative, causes rapid deterioration of natural rubber, synthetic rubber is specified for use in these systems as packing and oil seals.

HYDRAULIC PUMP WITH MOTOR

In our project, the rotary vacuum pump with motor can be use Pumps using the vacuum principle are popular because of their quiet performance and because their simplicity of design results in relative freedom from service troubles.

CONNECTORS

In our system there are two types of connectors used; one is the hose connector and the other is the reducer. Hose connectors normally comprise an adapter (connector) hose nipple and cap nut. These types of connectors are made up of brass or Aliminium or hardened steel. Reducers are used to provide inter connection between two pipes or hoses of different sizes. They may be fitted straight, tee, "V" or other configurations. These reducers are made up of gunmetal or other materials like hardened steel etc. The simple hydraulic jack model is shown in fig 4.1.

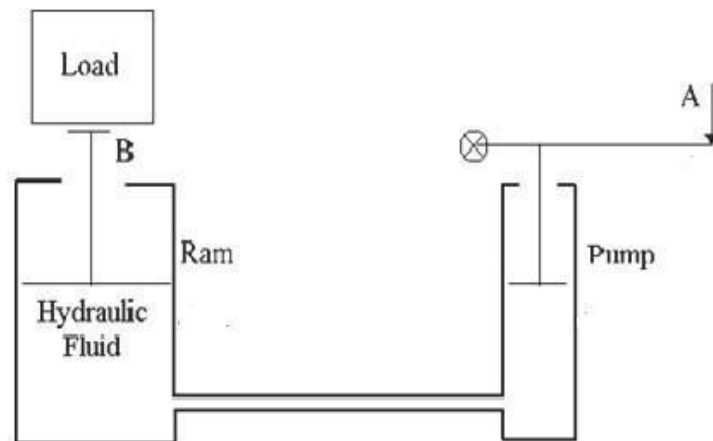


Figure 4.1 Simple Hydraulic Jack Model

RELATION BETWEEN LIFTING FORCE AND PISTON PUMP FORCE

$P_1 = P_2$ (by pascal's law which is pressure will be same

at entry and exit) $F_1/A_1 = F_2/A_2$

$$F_2 = F_1 \cdot A_2/A_1$$

$$F_2 = F_1 \cdot$$

$$\pi R_2^2 / \pi$$

$$R_1^2 F_1 =$$

$$F_1 \cdot R_2^2 /$$

$$R_1^2$$

Whereas,

$$P_1 = P_2 = \text{Pressure}$$

F_1 = Force on input

piston pump F_2 =

Lifting Force on

output piston

A_1 = Cross-sectional area of piston pump

A_2 = Cross-sectional area of piston

valve in outlet pump R_1 = Radius of

input piston

R_2 = Radius of output piston

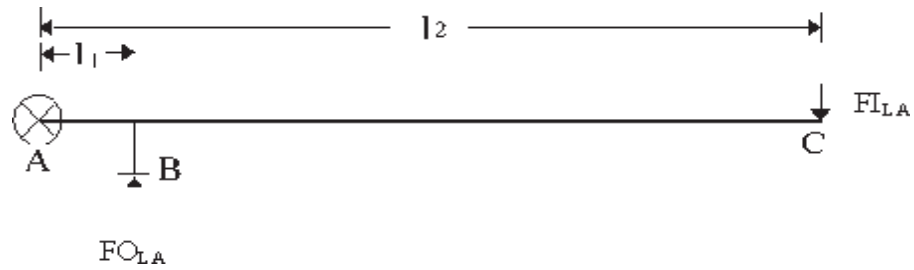


Figure 4.2 Design Bending Moment Diagram for Hydraulic Jack

Whereas,

FILA → Force applied by

input lever arm FOLA →

Output force produced in the
piston

Summing moments about Point A;

$$\Sigma MA = 0 = (FOLA * l_1) - (FILA * l_2)$$

or

$$(FOLA * l_1) = (FILA * l_2)$$

or

$$FOLA / FILA = l_2 / l_1$$

4.4.

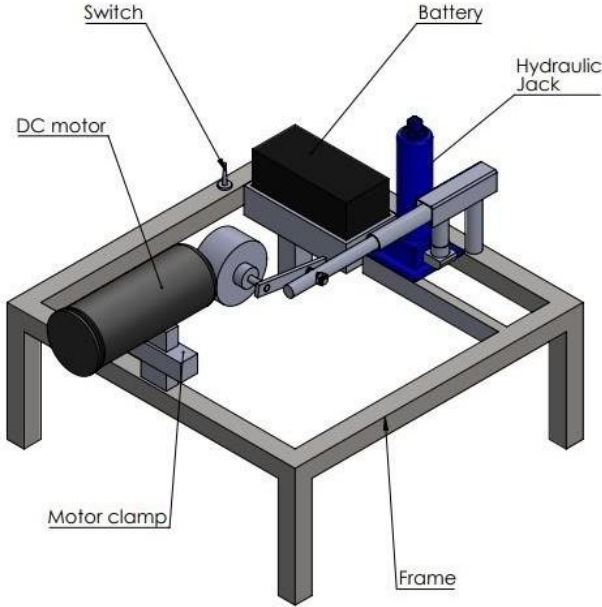


FIGURE 4.3 Proposed Design of Automated Hydraulic Jack

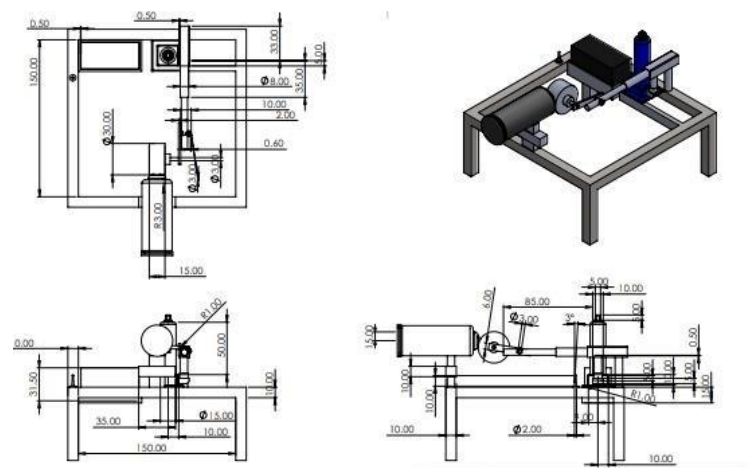


FIGURE 4.4 Drafting Representation of Automated Hydraulic Jack

WORKING PRINCIPLE

Some of the general properties of liquids in open containers have been described. It remains to discuss how a liquid will behave when confined, for, example, in an enclosed hydraulic system. Liquids are practically incompressible. The following two basic principles will help to explain the behavior of liquids when enclosed:

- Liquids are practically incompressible in the pressure ranges being considered. Stated simply, this means that a liquid cannot be squeezed into a smaller space than it already occupies.
- Therefore, an increase in pressure on any part of a confined liquid is transmitted undiminished in all directions throughout the liquid (**Pascal's principle**). For example, if pressure is applied at one end of a long pipe, the liquid, being practically incompressible, will transmit the pressure equally to every portion of the pipe.

METHODOLOGY

In normal conventional hydraulic jack, the intensity of pressure is transformed uniformly in all directions through a mass of fluid. In this study, Pascal's Law Concept is used to examine the lift force. Also, this study analyses hydraulic system components or hydraulic telescopic capabilities to better the hydraulic jack's capability. The simple automation work of jack can be done with the motor drive mechanism. The goal of this research is to design the hydraulic portable gadget to facilitate the mechanics in car maintenance and repair notably a component of the bottom machine. The data collection can be done by directly assessing the performance test of the portable automated hydraulic jack in automobiles and compared with the original jack. Also, some of the systems can be work by integrating the hydraulic principle to the scissor-based jack, this will work by transferring the hydraulic pressure with the help of hydraulic cylinder to the scissor jack mechanism, this will be useful for lifting the light weight automobiles for servicing or repair kind purpose, it can be handled indoor as well as outdoor.

In order to assist the elderly and physically disabled, this project's automatic hydraulic jack mechanism is more beneficial. So, they made an effort to seize the chance. This system can also be integrated with wiper motor as a driving mechanism for operating hydraulic jack.

The following four types of principle properties of materials decisively affect their selection

- a. Physical
- b. Mechanical
- c. From manufacturing point of view
- d. Chemical

The various physical properties concerned are melting point, Thermal Conductivity, Specific heat, coefficient of thermal expansion, specific gravity, electrical Conductivity, Magnetic purposes etc. The various Mechanical properties Concerned are strength in tensile, compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties. The various properties concerned from the manufacturing point of view are.

- Cast ability,
- weld ability,
- Brazability,
- forge ability,
- merchantability,
- surface properties,
- shrinkage,
- Deep drawing etc.

CHAPTER 5

SOME OF THE FACTORS AFFECTING AUTOMATED HYDRAULIC

JACK

MANUFACTURING CASE

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

QUALITY REQUIRED

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go for casting of a smaller number of components which can be fabricated much more economically by welding or hand forging the steel.

AVAILABILITY OF MATERIAL

Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

SPACE CONSIDERATION

Sometimes high strength materials have to be selected because the forces involved are high and the space limitations are there.

5.1.4 COST

As in any other problem, in selection of material the cost of material plays an important part and should not be ignored. Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

GENERALLY USED MATERIALS

The table (5.1, 5.2, 5.3, 5.4, 5.5) explains the generally used materials and type of materials used for the fabrication.

TABLE 5.1 CYLINDER TUBE MATERIALS

LIGHT DUTY	MEDIUM DUTY	HEAVY DUTY
1. Plastic	Hard drawn brass tube	hard drawn brass tube.
2. Hard drawn Aluminium tube	Aluminium Castings	Hard drawn steel tube tube.
4. Hard drawn Brass tube		Brass, Bronze, Iron or Castings, welded steel tube

TABLE 5.2 END COVER MATERIALS

LIGHT DUTY	MEDIUM DUTY	HEAVY DUTY
1. Aluminium stock (Fabricated)	Aluminium stock (Fabricated)	Hard tensile Castings
2. Brass stock (Fabricated)	Brass stock (Fabricated)	
3. Aluminium Castings	Aluminium, Brass, iron or steel Castings.	

TABLE 5.3 PISTON MATERIALS

LIGHT DUTY	MEDIUM DUTY	HEAVY DUTY
1. Aluminium Castings	Aluminium Castings Brass (Fabricated)	Aluminium Forgings, Aluminium Castings.
2.	Bronze (Fabricated)	Bronze (Fabricated)
3.	Iron and Steel Castings	Brass, Bronze, Iron or Steel Castings.

TABLE 5.4 MOUNT MATERIALS

LIGHT DUTY	MEDIUM DUTY	HEAVY DUTY
1. Aluminium Castings	Aluminium, Brass And Steel Castings	High Tensile Steel Castings
2. Light Alloy (Fabricated)		High Tensile Steel Fabrication

TABLE 5.5 PISTON ROD MATERIALS

MATERIAL	FINISH	REMARKS
MILD STEEL	Ground and polished hardened, ground and polished.	Generally preferred chrome plated
STAINLESS STEEL	Ground and Polished	Less scratch resistant than chrome plated piston rod

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- It requires simple maintenance cares
- The moving parts of this system are cooled by the oil itself used. Thus, this project does not require any cooling arrangements.
- The loaded light vehicles can be easily.
- Checking and cleaning are easy, because of the main parts are screwed.
- Handling is easy.
- Manual power not required
- Repairing is easy.
- Replacement of parts is easy.
- Maximum height up to 1.5 feet can be reached.
- No Oil wastage.

DISADVANTAGES

1. Initial cost is high.
2. High maintenance cost.
3. Chances of oil leakage

APPLICATIONS

- It is very much useful for Car Owners & Auto-garages. This automatic -hydraulic jack is used for lifting the vehicles.
- It can be applicable for all types of automotive vehicles like SUV, XUV, TEMPO TRAVEL, AUTO RICKSHAWS.
- The given below table 5.6 refers the list of materials used for the Automated hydraulic jack.

TABLE 5.6 LIST OF MATERIALS

Sl. No.	PARTS	Qty.	Material
i.	Hydraulic Cylinder	1	Aluminium
ii.	D.C Motor	1	Cast Iron
iii.	Hose Collar and Reducer	-	Brass
iv.	Stand (Frame), clamps and holders	-	Mild steel
v.	switch	-	Plastic or metal
vi.	battery	1	Plastic

TYPES OF COST OCCUR DURING PROJECT

MATERIAL COST

Raw materials like mild steel, copper, bronze, fasteners and hydraulic system components

LABOUR COST

Lathe, Drilling, Welding, Grinding, Power Hacksaw, Gas cutting:

OVERHEAD CHARGES

The overhead charges are arrived by “Manufacturing cost”

Manufacturing Cost = Material Cost + Labor cost

TOTAL COST

Total cost = Material Cost + Labor cost + Overhead Charges

CHAPTER 6

SUMMARY

Automated jack system is a simple and compactable design, some of them can propose miniature inbuilt jack models, and some of them can propose automated jack models. the reason why inbuilt jack system doesn't have the tendency to perform well is due to its additional weight in automobile and also ground clearance issues. These problems can be simply rectified by installing a automated system in conventional hydraulic jack. A typical locomotive mechanism that can be able to convert the output into reciprocating motion that will able to drive the jack into automated manner. Since it takes power from car battery itself, so no any additional power source is required. it reduces man power, time saving, easy to operate and able to lift the vehicle. By altering and improving the design modification and testing in future we can integrate this system to power brakes also, so the hydraulic fluid will circulate for car brakes and also for power lifting.

CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries. In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus, we have developed an "DESIGN AND DEVELOPMENT OF AUTOMATIC HYDRAULIC JACK" which helps to know how to achieve low-cost automation. The operating procedure of this system is very simple, so any person can operate. By using more techniques, they can be modified and developed according to the applications.

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