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# “INBUILT HYDRAULIC SYSTEM FOR LMVs”: A Review

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**ABSTRACT:** An automobile hydraulic Jack can be easily operated by a single push button provided on the dashboard. The system operates on hydraulic drive which consists of three main parts as a hydraulic pump, driven by an electric motor, hydraulic cylinder to lift the vehicle. The hydraulic jacks actuated separately for either side of the car as per the breakdown condition. This Jack will be very useful for all senior citizens and especially for ladies who find it extremely difficult to operate the jack manually in any breakdown conditions. The motive behind using a hydraulic system instead of a pneumatic system is, more power is produced by the system and the simplicity in design as compared to pneumatic design. As the hydraulic oil is incompressible so the lifting capacity is more as compared with the pneumatic system which operates on air which is compressible.

## I. INTRODUCTION

It is believed that ‘Necessity is the mother of invention’. Here the necessity lies in reducing the human effort applied during manual operation of the jacks and hence the need of the invention. To provide a safe and simple automatic hydraulic jacking system without manual effort. To provide a new jacking system that can be operated from within the vehicle by means of a dashboard control panel. Hydraulics is the science of transmitting force or motion through the medium of a confined liquid. In a hydraulic device, power is transmitted by pushing on a confined liquid. The transfer of energy takes place because in a hydraulic device, power is transmitted by pushing on a confined liquid. Inbuilt hydraulic jack system is based on the principle of Pascal’s law. Hydraulics is mechanical function that operates through the force of liquid pressure. In hydraulic based systems mechanical movement is produced by contained, pumped liquid typically through cylinders moving pistons. Several upstarts relate to hydraulic system and more especially, to an inbuilt hydraulic jack system. Most of the vehicles are lifted by using screw jack. This needs high man power and consumes a lot of time. Various types of jacks or lift devices has been installed on for lifting the vehicle. Conventionally we have always used a separate jack for each of 4 wheels; in stead here, we have the jacks permanently installed on the vehicle. It is an object of innovation to provide ideal jack system that can be operated by driver from inside the car. It is also an object of innovation to provide an ideal hydraulic system which is operated by cam mechanism which actuates hydraulic jack which will lift the vehicle. It is a device which will be used in future to tire changes purposes. When tire gets punctured, we need to change the tire and with the help of this system, vehicle lift by

## II. LITERATURE REVIEW

The conceptual thought of lifting the vehicle using jacks has emerged earlier at the period of late 1920’s. Pneumatic jacks were initially prescribed for this scenario since it can be compressed; it was believed that it had a far better scope than any other working fluid in nature to lift the vehicle. But as time emerged it is found that the better and efficient means of lifting vehicle was hydraulics which is still in practice in lifting the heavier loads, since hydraulics are provided with accumulators so the rate of getting injured due to failure is considerably reduced. This work is inspired by journal papers published in different international journals. These journal papers emphasized on the use of dc motor, joined with lead screw and hydraulic cylinders for lifting vehicle to reduce the human effort. Hence, hydraulic lift results in easy and safe operation.

1. Have presented that whenever any vehicles undergo a tyre failure, it becomes a very cumbersome task for the person to lift the vehicle from the ground level and lot of manueffort is required even though a jack is used.
2. Have studied that in order to mitigate the problems associated with the use of a single jack and other lifting devices to raise cars completely off the ground to effect repairs.
3. An Experimental investigation of Fabrication of Inbuilt Hydraulic Jack for Four Wheelers, International



Journal of Research in Engineering and Technology. This paper explains that this project not only saves human effort but also reduces the replacement time during the time of puncture. Lifting capacity is more in hydraulic jack in comparison with pneumatic.

### III. METHODOLOGY

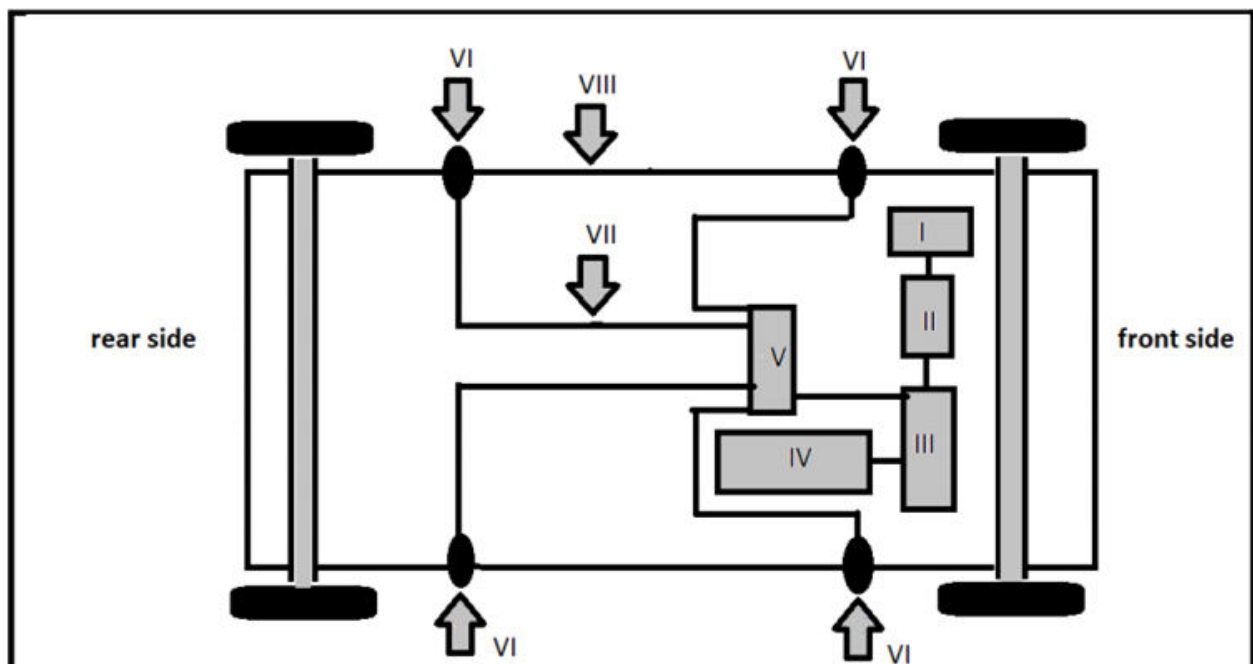
The hydraulic system mechanism is mainly used for lifting the car. The mechanism is powered by the battery. The control of the mechanism will be provided to the user's hand. When the operator presses the switch, the battery will run the hydraulic pump. The pump will press the oil from the reservoir to the control valve. The flow of oil to the double acting hydraulic cylinder can be controlled with the help of this control valve. When the control valve directs oil to the cylinder for a lifting stroke the pressure will be imparted to the piston and the stroke will take place. Then the piston will start lifting the car on reaching the ground level. For the down movement of a lifted car the user can again operate the control valve which will direct the flow of oil to the other side of the cylinder and the stroke will be imparted with the pressurized oil. After operation the user will press the off button and that will cut off the electric power to the motor. This will stop the pump and circulation of oil in the system. The mechanism used in this study is mainly used for lifting the car. The method used here is automatic which replaces manually operated screw jack. A separate system consisting of two hydraulic jacks, pump and a control valve will be connected and positioned in the vehicle. The mechanism is powered by the battery. The control of the mechanism will be provided at the user hand.

When the operator presses the switch, the battery will run the hydraulic pump. The pump will press the oil from the reservoir to the control valve. The flow of oil to the double acting hydraulic cylinder can be controlled with the help of this control valve. When control valve directs the oil to the cylinder for a lifting stroke the pressure will be imparted to the piston and the stroke will take place. Then the piston will start lifting the car from the ground level. For the down movement of a lifted car the user can again operate the control valve which will direct the flow of oil to the other side of cylinder and the stroke will be imparted with pressurized oil. After operation the user will press the off button and that will cut-off the electrical power to the motor. This will stop the pump and the circulation of oil in the system.

### IV. WORKING PRINCIPLE

- The Jack will be installed on both sides of the chassis according to the weight distribution of the car.
- These hydraulic jacks are operated by a 12 volt DC battery.
- At a same time all jacks can work and vehicles can lift from one side and also from the other side as per requirement.

#### Schematic Diagram of Hydraulic Jack System



### REQUIRED COMPONENTS

- I. 12V DC Battery
- II. DC Motor
- III. Hydraulic Pump (Gear Pump)
- IV. Hydraulic Fluid Reservoir
- V. Control Valve
- VI. Double Acting Hydraulic Cylinders
- VII. Hydraulic Hose Pipe
- VIII. Chassis

#### I. Battery

- An automotive 12 volt battery is a rechargeable battery that is used to start a DC motor.



#### II. DC Motor

- A DC motor is any motor, a class of electrical machines whereby direct current electrical power is converted into mechanical power.
- Most often, this type of motor releases forces that magnetic fields produce.



#### III. Oil Pump:-

The heart of the hydraulic system is the hydraulic pump develops partial vacuum in the suction port line and draws in oil from the oil sink & pushes the oil into the wetted port line.

- **Classification of Hydraulic Oil Pumps:-**

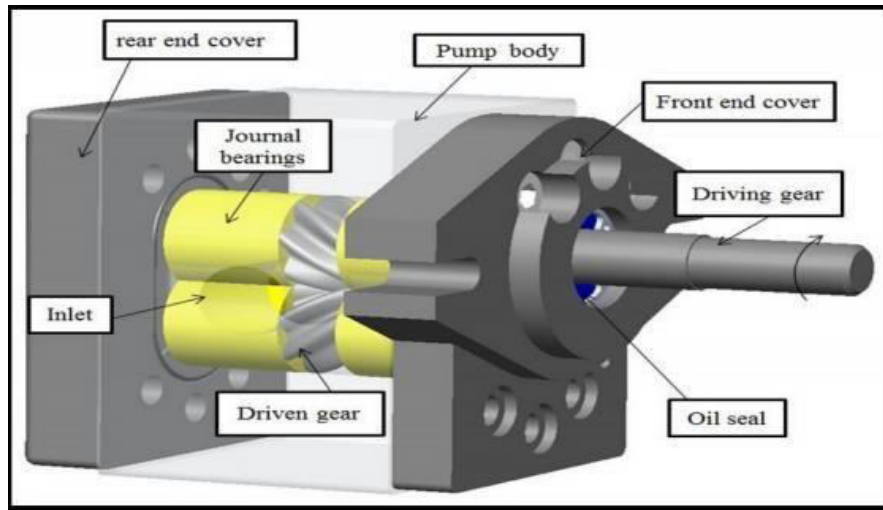
A) Rotary hydraulic pump:-

1. Gear hydraulic pump
2. Vane hydraulic pump

B) Screw hydraulic pump:-

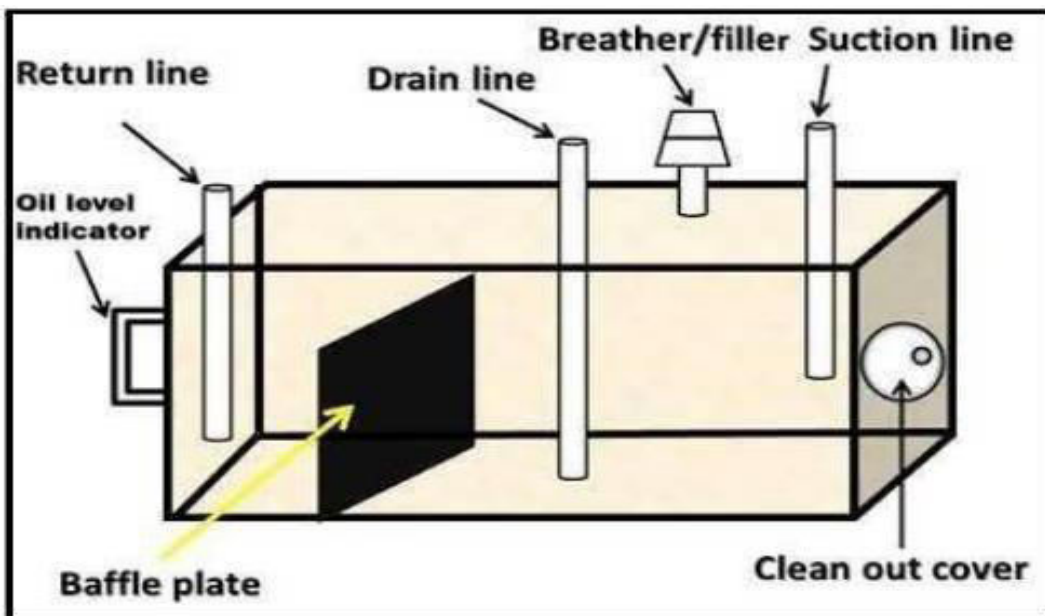
1. Axial piston hydraulic pump
2. Radial piston hydraulic pump
3. Reciprocating piston hydraulic pump

**Gear Pump:-**



- Gear pump is a type of positive displacement content delivery rotary pump.
- It converts mechanical energy into fluid energy creating suction with the help of its gear meshing, the space left between this gear meshing sucks in a high viscous fluid displacing it along the walls of the casing and then towards the output.
- Gear pump is well suited for high viscous fluid such as oil as it does not require priming.
- Generally helical gear pump is preferred over spur gear pump due to better working behavior.
- However spur gear pumps are simpler and cheaper.

**Reservoir & Its Mountings Reservoir:-**



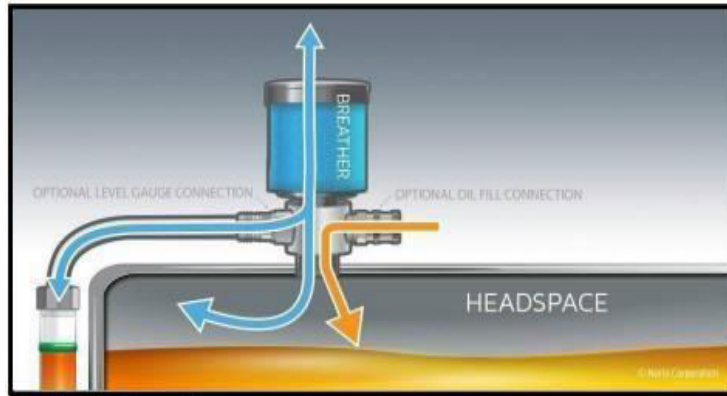
**Fig.:- Hydraulic Fluid Reservoir**

- The reservoir is used to store the oil. The reservoir is the place where the hydraulic oil goes to rest for a while.
- Contaminants that the oil has picked up settle to the bottom of the tank & from sludge, so one of the purposes of the reservoir is to help clean the oil.
- The capacity of the reservoir, measured in gallons or similar volumetric unit.

**Mountings of Hydraulic Reservoir :-**

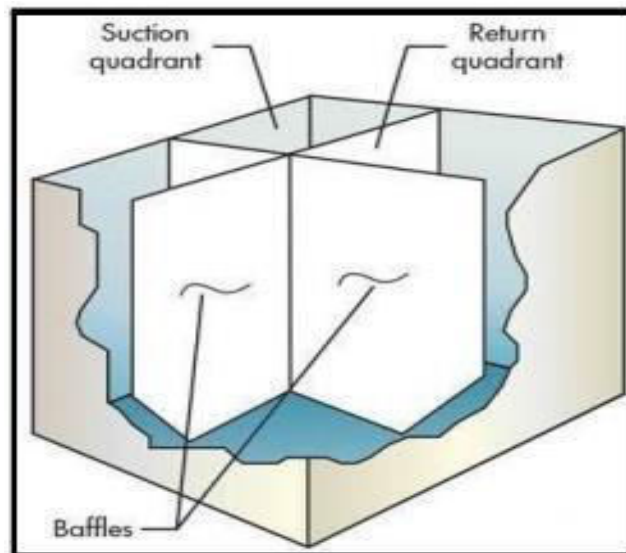
**A. Air Breather:-**

- Air breather is used to filter the air.
- In addition to removing airborne dirt, some types of breathers are designed to remove the moisture from the incoming air.



**B. Baffles:-**

- Baffle is fixed to the interior of the reservoir.
- The purpose of the baffle plate is to separate the pump inlet line from the returnline.
- This is done to prevent the same fluid from circulating continuously within the tank, in this way it is ensured that all the fluid is uniformly used by the system.



**C. Drain plug:-**

A drain plug is a plug which is taken out to allow it to be drained from the tank such as an engine oil pan or pump. Remove the oil plug & allow oil to drain out. Oil seal is used to prevent oil leakages.



Fig. :-Drain plug

**D. Hydraulic Fluid Strainer/Filter:-**

- Suction filters are designed to remove fine contaminants from the suction line of the hydraulic system.
- Their purpose is filtration media that captures solid particles and pollutants that are less than 50 microns in size.
- Filters capture solid material before it becomes problematic.

**E. Oil Level Indicator:-**

- Oil level indicators are designed to indicate the oil level inside the tank.
- Oil level indicators are very useful in visually monitoring the oil level from a distance.



Fig.:- Oil Level Indicator

#### F. Pressure gauge:-

- A pressure gauge is a fluid intensity measurement device.
- Without a pressure gauge hydraulic system would be both unpredictable and unreliable.
- Gauges help to ensure there are no leaks or pressure changes that could affect the operating condition of the hydraulic system.



Fig.:- Pressure gauge

#### V.CONCLUSIONS

This concept will eliminate the need of carrying a conventional mechanical jack while travelling.

After successful implementation of this idea in small passenger cars (LMVs), future developments can be made in design to apply the same in heavy duty automobiles also. With the help of this system, the driving of vehicles will be easy for everyone.

With some design consideration an inbuilt car lifting mechanism can easily be fitted in all light weight automobiles. The project works on hydraulic power provided by battery. Maintenance and service of the vehicle can be easily done by this project. With this project the usage of automobile can be made easy for women and old people. Some extra automation like solenoid control valve can add great value to the project. The inbuilt jack is operated by battery so it can also be used when the vehicle engine is not started. Automatic inbuilt jacking system in automobiles will not only save the effort of a person but will also save one's precious time under critical circumstances. This concept will eliminate the need of carrying a conventional mechanical jack while travelling. Motor operated mechanical jacks are already in the market but the jack's design is the area of concern. In order to make built-in jack system practical, jack's shape and type need modification. Mechanical jacks are pretty easily operated but their effectiveness and maintenance may become an issue as they will be moved with chassis, constantly underneath hence, chances of rusting and damage is high. Hydraulic jacks look convenient to use and can also prove quite effective and easy to maintain (as completely closed) in long run, they will provide more power too but there are also some challenges like keeping low production cost and designing of jack which can be carried with the chassis given, common ground clearance level of an automobile, and keeping in

#### REFERENCES

1. Rajmohan G, Jazim Haris, M Shafin K, Sabah Salam K, Santosh Kumar S, all assistant professor at "International Journal of Advanced Research Electrical, Electronics and Instrumentation Engineering".
2. Parth M Patel, V Shah, S R Shah, Parth S Patel worked on "Automatic Hydraulic Jack Inbuilt in a Four Wheeler from "International Journal of Scientific and Technology Research". Volume 5. Issue on 8 August 2016.
3. Design and Fabrication of Hydraulic System for Four Wheeler from "International Research Journal of Engineering and Technology (IRJET)".
4. Integrated Automated Jacks for Four wheeler from "Scholars Research Library, European Journal of Applied Engineering and Scientific Research 2012, 1 (4) : 167-172.
5. Prof. Surendra Agrawal worked on Inbuilt Hydraulic Jack in Automobile Vehicles, International Journal of Innovations in Engineering and Technology (IJET)





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