

Low Cost Hydraulic Lift

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Abstract - This paper is proposing a Fluid Machinery application that would provide storing of a pressurized fluid and arrangement of transmitting power at certain distances with lower cost. This application of power is very useful for lifting heavy objects in earth moving vehicles. Incompressible fluids are used by the Hydraulic systems such as water, or oil to transmit power and forces from one location to another within the fluid. [1]

Key Words: Hydraulic, Lifts, Incompressible fluids, Pneumatic systems, Rack & pinion, Rectifiers.

1. INTRODUCTION

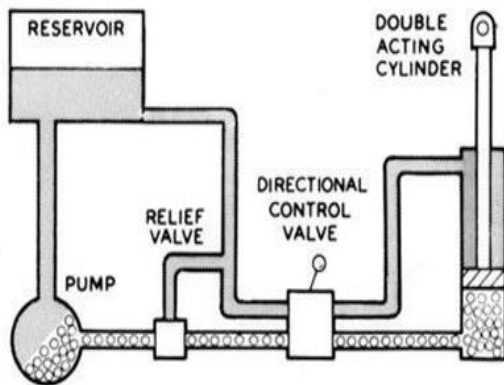
Hydraulic lifting machines are widely used for the lifting, moving and pushing function in mining, construction and steel industries and in material handling equipments. Since 1950s the applications of hydraulic systems have been started in the industries and this form of power has become standard for the operations of industrial equipments. 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 equipments 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. [2]

2. LITERATURE REVIEW

The traditional hydraulic system consists of various useful components which allows it to perform the lifting functions precisely. These components are costly and if any part is faulty then the replacement of that part costs much, therefore the need for a low cost, simple mechanism, hydraulic system is required. As you can see in the below figure traditionally there are components like reservoir which contains the hydraulic fluid which is incompressible. The size of the reservoir depends on the size of the system and the amount of hydraulic fluid required by it and thus the cost of it also increases with this. Another main component is the fluid pump which pumps the fluid from the reservoir to the cylinder, it should be of high power to pump the incompressible fluid in the system and a manual plunger is used to control the direction of this pumped fluid, this plunger directs the fluid to the upper section of the cylinder or the lower section according to the demand. A relief valve is also added before the manual plunger so that when the load on the hydraulic ram is high, then the excess pressure on the pump is reduced by the relief valve by passing the fluid to the reservoir. Some components can be replaced by a simple rack and pinion mechanism and thus reducing the overall cost of the hydraulic lift.

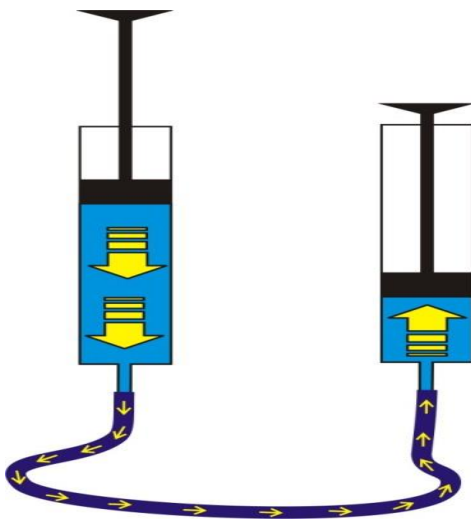


3. METHODOLOGY

This project is based on Pascal Law and Fluid machinery concept with the involvement of Rack & Pinion.

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. We use two syringes and coupled with one sliding mechanism and this mechanism is powered from a slow DC gear motor for Lifting good and vehicles

4. PROJECT CONSTRUCTION

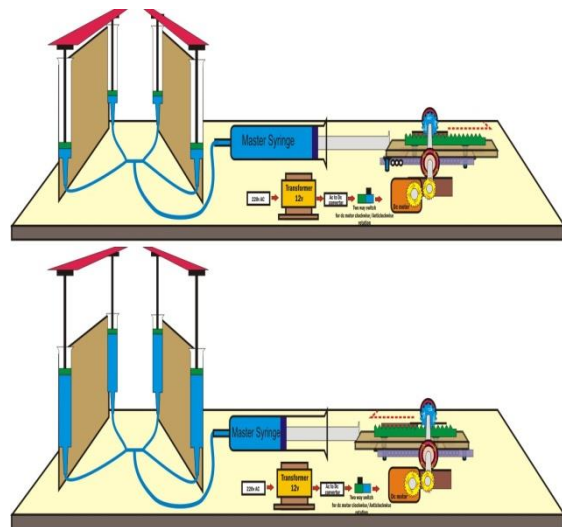
[1] First we arrange one sliding channel and fix it on a wooden frame.

[2] We use 8mm iron rod and cross on between 2 bearing stand. Then we fix one Pinion gear in between 2 bearing stand. This pinion gear rolls over rack mechanism which is fixed on sliding channel.

[3] We attach one DC gear motor with rod shaft gear for sliding movement to the entire set.

[4] We attach one syringe with sliding channel. Sliding mechanism provides smooth and constant fluid pressure to the syringe fluid.

[5] Now we construct a simple car lifting platform with help of 4 syringes and connect with master syringe. When the master syringe cylinder injects fluid to 4 syringes, platform lifts up as shown in figure



5. COMPONENT USED:

1. **Slow speed Crouzet motor gearbox**
(Powerful gear motor. 10 RPM @ 12 Vdc / 90 mA (no-load). Operates on 4-15 Vdc. 3.6" x 2.36" x 2.24" overall dimensions. Crouzet motor and final drive shaft, both extend from the same side of plastic gearbox. 5/16" diameter flatted shaft is 0.9" long. 8" pigtail leads.)
2. **Rack and pinion gear**
3. **Sliding channel**
4. **Syringe-5**

5. *Syringe pipe*
6. *Bearing 608*
7. *Bearing stand*
8. *Diode (RECTIFIER 4007)*
9. *Sliding switch*
10. *Transformer (24 V)*
11. *Metal and wooden body frame*

6. CONCLUSION:-

After construction of this project we reach to this conclusion that we can easily remove the reserve fluid tank, fluid motor and manual plunger valve from our heavy earth mover vehicle to reduce its cost. We can implement this concept in robotic arms, conveyor, load lifting ramps and heavy load turning table. We can improve this concept by adding on gear boxes in between the motor and rack pinion assembly. This technique can reduce the heavy cost cutting in hydraulic control machines.

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REFERENCES

- [1]<http://whatis.techtarget.com/definition/hydraulics>
- [2]<http://ispatguru.com/basics-of-hydraulics-and-hydraulic-systems/>
- [3]<https://crossmfg.com/resources/technical-and-terminology/basic-hydraulic-theory>
- [4]<http://www.brighthubengineering.com/hydraulics-civil-engineering/43171-what-are-the-basic-principles-of-hydraulics/>