

AIR PRESSURE CYCLE

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ABSTRACT

The air pressure cycle can be run on compressed air is used to run the rear wheel through a chain sprocket where the pneumatic drilling device is mounted. The actuation of the pneumatic drilling device used in the pedaling shaft is connected by 30 liters air capacity tank which in turn is actuated by a regulator valve connected to the pneumatic device and the pressure gauge is used to note pressure inside the air tank. This ensures that the pneumatic drilling device is starting to rotated. The rotary motion is started in the drilling machine, this motion is transferred to the pedaling shaft. The speed of the cycle is controlled by the regulator valve according to the condition. After the air tank is completed we can refilled again and again. Air pressure cycle is designed to reduce the global warming and greenhouse gases.

Key words: *Regulator valve, pneumatic mechanical device.*

INTRODUCTION

Pneumatic Mechanical Device

Pneumatic Drilling Machine are equipped with chuck arrangement at the one end and the air inlet hose at the other end. To achieve forward and reverse rotation of the chuck is controlled by the direction control switch in the drilling machine. When the direction switch in the reverse side then the chuck rotation in the anticlockwise direction it help for the forward action of the cycle. The drilling

machine is operated in the minimum pressure of the 6.2 bar stored in the air tank otherwise the drilling machine is not operated. The air discharge is controlled by the regulator valve which is connected in the air tank then the speed of the cycle is controlled. Initially the regulator valve is fully opened to achieve the maximum torque is obtained, then after sometime the valve is adjusted according to the speed required of the cycle. Pneumatic Drilling Machine is available at different specifications, in our project we are using 3/8" Reversible Air Drill.



Fig 1.1 Pneumatic Drilling Machine

Specifications of the Pneumatic Drilling Machine:

Free Speed	1800rpm
Air Consumption	6cfm
Operating Pressure	90psi
Air Inlet	1/4 BSP
Chuck Size	10mm
Weight	1.09kg
Length	203mm

Regulator Valve

A regulator valve is a device that regulates, directs or controls the flows of an air by opening, closing, or partially obstructing various passageways. Valves are technically fittings. When the valve in the open position the compressed air flows from higher pressure region to the lower pressure region. The pressure is controlled by varying the position of the valve. The regulator valve is actuated by the manual control. In our project we are using Two-Port Valves, the operation positions for this type valves can be either shut so that no flow at all goes through it, fully opened for the maximum flow or partially open at an any degree in between. For example, the regulator valve is mostly used in the air compressor to manage the pressure inside the compressor tank. It is important to know the primary function and operation of various types of control components not only for good functioning of a system, but also for discovering innovative methods to improve the flow control system for a given application.



Fig 1.2 Regulator Valve

One of the most important considerations in any fluid power system is control. If control components are not properly selected, the entire system does not function as required. In fluid power, controlling elements are called valves.

Pressure Gauge

A Pressure Gauge is a pressure sensor that is used to indicate the pressure of a given process or system. A pressure gauge usually refers to a self-contained indicator

that converts the detected process into the mechanical motion of a pointer. Depending on the reference pressure used, they could indicate absolute, gauge and differential pressure. A pressure gauge used to measure pressures lower than the ambient atmospheric pressure. Pressure gauge mainly used to note the charging and discharging the flow in the tank. Pressure gauge are also used to control the fully component. Pressure gauge are available at 1/4" BSP are usually used for gauges with size diameter 63mm.

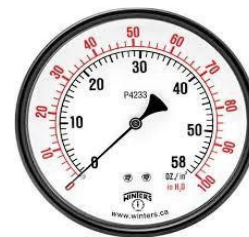


Fig 1.3 Pressure Gauge

Air Tank

Air tank are used to compress the air under pressure that is greater than atmospheric pressure. The stored air is used at any instant at anywhere and anytime. Mainly air tanks are setup with the pressure gauge and the control valve. The purpose of the pressure gauge to note the rate of air filling in the tank and for the maximum capacity of the tank. For the safety purpose the air filling is below the rate capacity of the air tank. Air tank are may be exploded due to the over filling air above the rated capacity. The control valve or regulator valve are used to discharge the air from the tank at the required pressure. Mainly the tank materials are high strength because it will withstand the maximum pressure and other external force from the surroundings.



Fig 1.4 Air Tank

Applications

In automobile vehicles the air tanks are used in the air braking circuit. Air compressor is mainly used in the working of the pneumatic mechanical devices. In our project, we are using Volvo Air Tank part number 20485246 and their storing capacity (Operating Pressure) is 15bar.

Poly Urethane Hose

A Hose is a flexible hollow tube designed to carry the air from one place to another place. Hose is made up of the chemical combinations. Transmission of fuel (AIR) from the air tank to the pneumatic drilling machine by using the hose. In our project, we are using Polyurethane hose of diameter 8mm.

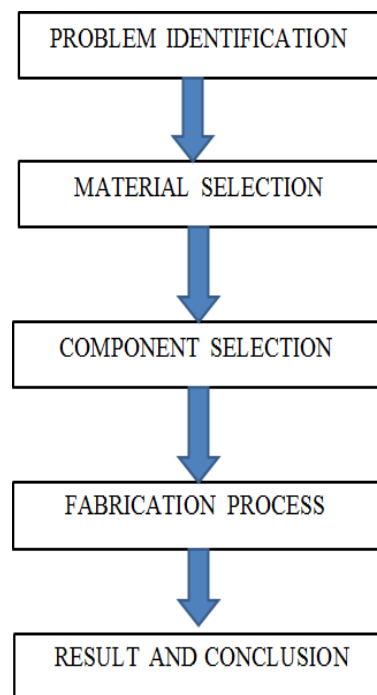


Fig1.5 Poly Urethane Hose

Applications

Air hose are used in underwater diving to carry air from a surface compressor or from air tanks. Industrial uses for operating flexible machinery and worktable tooling such as pneumatic screw drivers, die grinders, staplers, etc.,

2. METHODOLOGY



2.EXPERIMENTAL DETAILS

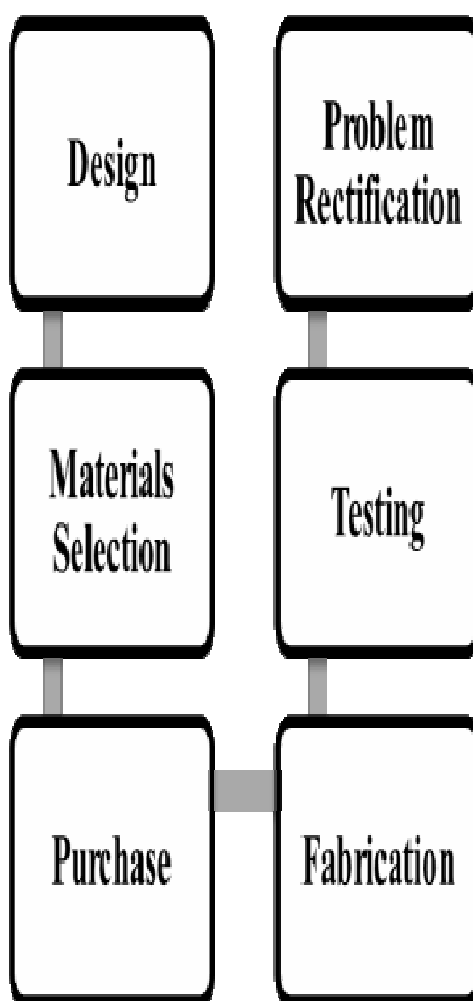
Bicycle, Regulator valve, Pneumatic drilling machine, Pressure Gauge, Hose is purchased. Then reconnaissance was carried out about the methods through which the project was to be done. Finally a most efficient and economical method was selected for the experimentation. As pneumatic drilling machine is the major equipment used in our project. It is essential to have a study over it. Pneumatic Drilling Machine is nothing but a device that allows continuous rotary motion in only one direction. Air tank, Pressure gauge and Regulator Valve are assembled together by using fastening operation. Fastening is the best way to assemble and disassemble the components easily. Then the pneumatic drilling machine mounting process is carried out simultaneously in the bicycle for the mounting we are chosen the welding and fastening operations is carried out. Welding operation is stronger than the fastening operation, but the removal of

welded joints is very difficult when compare to fastened operation.

Finally, after the mounting the hose is required to connect the air tank rotary is started.

and the pneumatic drill. Hose is used to transmit the air from the tank to the drill inlet after that the

Flow Chart



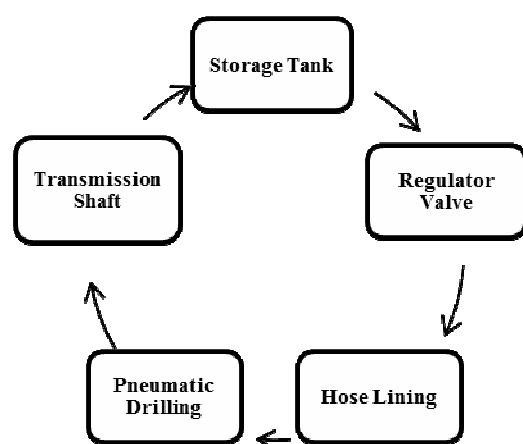
RESULT AND DISCUSSION

Initially, the air tank is filled with air up to 8 bar pressure using the two wheeler mouth. Pressure gauge is used to indicate the air capacity in the air tank and it shows the air discharge rate from the air tank. Air is transmitting through the hose from the storage tank to the pneumatic drilling machine. The drilling machine is mounted in the cycle pedal by using the sleeve or coupling, when the drill chuck is rotated then the shaft in the pedal are also rotated along with. The achieve the forward motion the drilling machine is required maximum pressure to start the cycle. For control the pressure in the tank the regulator is used in the tank. By adjusting the regulator valve the speed is controlled. For continuous running process the tank is refilled again and again.



Fig 4.1 Air Pressure Cycle

Flow Chart



Merits and Demerits

Merits

- It is eco-friendly to our surrounding.
- As a result of pneumatic systems running on air, safety hazards are significantly reduced.
- There are limited occurrences of fire because air is non-flammable.
- Air is easily available in the plenty of environment.
- It is not affecting the environment.
- It will reduce the driver effort.
- It required less driving force.

Demerits

- Air pressure controlling is difficult in the air tank.
- Manual pedalling is not possible.
- Air discharging is quickly without the regulator valves.
- Pneumatic system produces some noises.
- Air filling very difficult without the pressure gauge.

3. CONCLUSION

Air pollution is major issues in the day-to-day life. Normally, commercial vehicles are harmful to our health and some other problems related to environment. Our project Air Pressure Cycle can be run on the compressed air which is available in the plenty on the environment. Our aim to reduce the air pollutants and increases the economical values. In this good manner our project is designed and fabricated.

References

- [1] James C. Martin, "Validation of a Mathematical Model for Road Cycling Power," Journal of Applied Biomechanics, 14, 276-291, 1998.
- [2] Carmelina Abagnale, "Model-Based Controller an Innovative Power-Assisted Bicycle," Energy Procedia, 81: 606-617, 2015.
- [3] Magnet Guide and Tutorial, Alliance LLC, Valparaiso, United States, 2016.