

## PNEUMATIC MULTI CYLINDER LINER PULLER

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**ABSTRACT**-There are many possibilities of the cylinder over heating which might cause the cylinder liner damage. So that as a perfect solution the pneumatic cylinder can be used for the replacement of the cylinder liners in engine block. The pneumatic cylinder liner puller is composed of the simple arrangement of double acting cylinder, solenoid valve, puller plate and pneumatic junction box. So that as a solution for the replacement of cylinder liner the compressed air can be used a medium for pneumatic cylinder movement. It could be most useful and handfull.

Key Words: Liner, Pneumatic, Solenoid valve, Cylinders.

### 1.INTRODUCTION

Our task as Mechanical Engineers was to design and build a pneumatic multi cylinder liner puller . It is the simple design of an pneumatic operated liner puller. Our research paper describes the design of a liner puller equipment. We have worked on the same project at our college presenting a synopsis showing its basic construction and working. And giving out a right way and a simple construction that can be done to remove the liner from the cylinder block.

Basically the cylinder liner is a hollow cylindrical shell which acts as the enclosure in which the combustion takes place. Of course the word hollow does not imply that it is weak in strength for it is under the fluid pressure due to combustion and hence must withstandthe high

level of hoop stress induced in it. Another factor is the big temperature difference on the outside and inside (being in proximity of the combustion chamber) of the liner which tends to induce thermal stresses and the liner has to withstandthose as well. Apart from the liner surface is also resistant to wear and corrosion. The picture below shows the image of a typical cylinder liner which is resting on wooden blocks. As you can seen from the picture it is made up of quite thick material and the empty slots which we see towards the middle are known as scavenge ports.

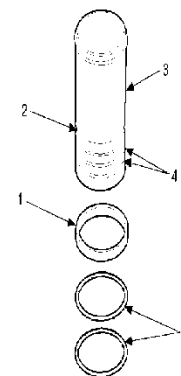


Fig -1 cylinder liner

- |                     |                 |
|---------------------|-----------------|
| 1.CreviceSeal       | 4.O-ringGrooves |
| 2.CreviceSealGroove | 5.D-ringSeals   |
| 3.CylinderLiner     |                 |

Construction is done either by centrifugal casting in case of smaller liners and sand casting in case of larger liners. The inner surface of the cylinder liner is usually chrome plated to make it smooth but this smooth also has its drawback that it does not allow oil to spread out properly thus affecting liner lubrication in a negative manner. This was rectified to a certain degree through the use of porous chrome honing. A cylinder liner is a removable component, cylindrical in shape, inserted into the engine block. It provides the surface for the piston to slide and carry out its compression task. It can be replaced when worn out. Cylinder liners are made from close grained cast iron.

### 1.1 Cylinder liner types

In wet liner the water is in direct contact with outer surface of the liner whereas in dry liner the water is in indirect contact with outer surface of the liner, i.e. cylinder casting contains wet jackets. A leak-off hole is often provided between the upper and lower rings to ensure that water passing the one or oil passing the other runs to the outside of the engine. The upper part of the liner bore, where the top piston ring reaches the top of its travel, suffers the greatest wear. This is because at this point the ring comes to rest and reverses its direction of motion and it is difficult to maintain an adequate film of oil between the surface of the ring and liner. Also, the gas pressure is highest when the ring is in this position, forcing it hard against the liner. Besides, the top of the liner is hot from the repeated combustion cycle which tends to dry any

oil there is. Liners are sometimes specially designed to promote cooling without sacrificing strength.

### 1.2 Pistons Scuffed Piston

The pistons should come next in the inspection process. Each piston should be examined for cracks, holes, scuffing or excessive pitting. Cracks in the piston will usually be located near the piston pin and/or skirt. If scuffing is found on the sides of the piston, examine the cylinder that the scuffed piston was removed from. If scuffing is found on the cylinder wall, all cylinders will most likely need to be bored oversize. All pistons would then be replaced. The areas between the grooves in the piston that hold the piston rings are called ring lands. Pay particular attention to the ring land area for signs of stuck rings, broken lands, or broken rings. Using a feeler gauge, measure the clearance between the rings and the ring lands and



Fig-2 Piston scuffed

compare to service specifications. Manufacturer's specific service procedures detailing piston service and inspection should be followed to the letter. Scuffed Piston Piston diameter can be measured using a micrometer, though most

automotive repair shops will leave piston and piston-to-boreclearance measurements to a machine shop. If the piston passes all inspections and will be reused, remove the rings and use a ring groove cleaner or an old broken piston ring to remove the carbon from the piston ring grooves. Also, clean the top of the piston with a scraper. A wire brush is not recommended for use when cleaning pistons because of the potential for damage.

**II. EXPERIMENTAL SETUP**

**2.1 COMPRESSOR**

Compressor is used to compress and deliver it in high pressure. Air compressors are utilized to raise the pressure of a volume of air. Air compressors are available in many configurations and will operate over a very wide range of flow rates and pressures. Compressed air was expelled by primitive man to give glowing embers sufficient oxygen to allow them to flare up into a fire. The air exiting the compressor is saturated with moisture and will have compressor lubricants. Compressor achieves this high pressure delivery by the rotating motion of a piston and a cylinder arrangement. So thus as in which it helps to send the air into the system with an high pressure. And the compressed air with high pressure can be sent into the system. Air compressors are available in many configurations and will operate over a very wide range of flow rates and pressures. Compressed air was expelled by primitive man to give glowing embers sufficient oxygen to allow them to flare up into a fire. During the compression process, the

temperature increases as the pressure increases. So the outside air can be able to compressed and send to the system in the case of required process to be carried out in the stages of the system. And the high pressure air can be easily obtained from the air compressor. Develop power in one direction only.

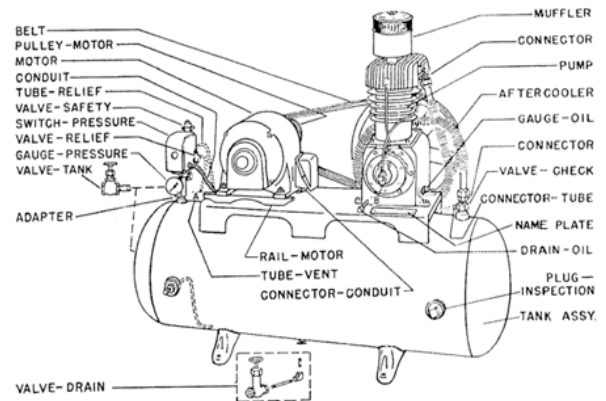


Fig-3 Compressor

**2.2 Double acting Cylinders**

A double acting cylinder is employed in control systems with the full pneumatic cushioning and it is essential when the cylinder itself is required to retard heavy messes. This can only be done at the end positions of the piston stroke. In all intermediate position a separate externally mounted cushioning derive most be provided with the damping feature. The normal escape of air is out off by a cushioning piston before the end of the stroke is required. As a result the sit in the cushioning chamber is again compressed since it cannot escape but slowly according to the setting made on reverses. The air freely enters the cylinder and the piston strokes in the other direction at full.

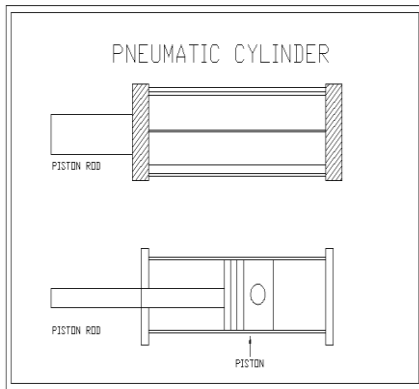


Fig-4 Double acting cylinder

Product Name	Air Cylinder
Model	SC
Action	Double
Rod Type	Single Rod
Bore	32mm
Stroke	100mm
Rod Dia	9.9mm
Port Dia	8.3mm
Max Press	0.7Mpa
Overall Size(Approx)	45 x 45 x 245mm / 1.8" x 1.8" x 9.6"(L*W*H)
Material	Alloy & Metal
Weight	676g
Package Content	1 x Air Cylinder

A solenoid valve is an electromechanical valve for use with liquid or gas controlled by running or stopping an electrical current through a solenoid, which is a coil of wire, thus changing the state of the valve. The operation of a solenoid valve is similar to that of a light switch, but typically controls the flow of air or water, whereas a light switch typically controls the flow of electricity. Solenoid valves may have two or more ports: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. release, dose, distribute or mix fluids.

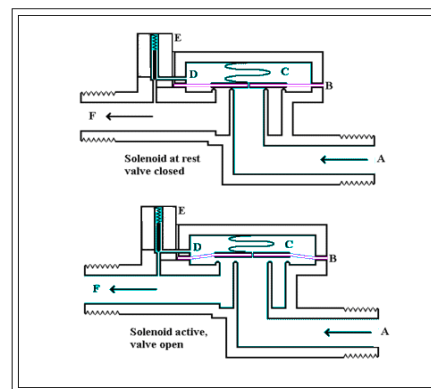
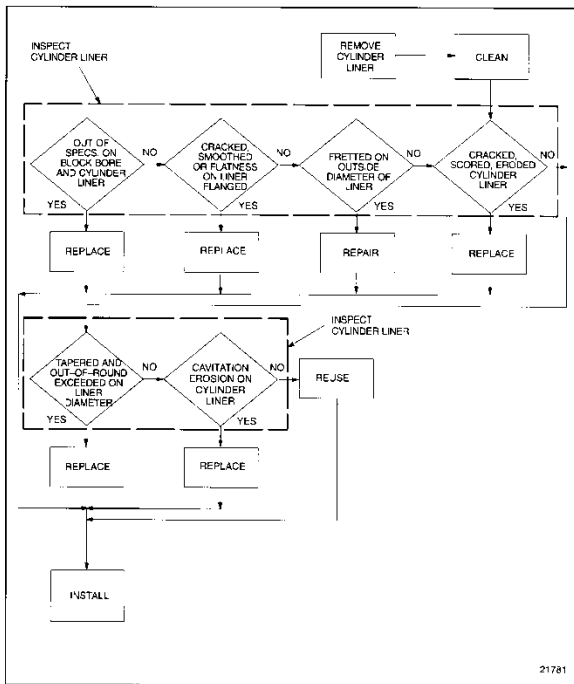


Fig-5 Flow of air circuit

- A-Input
- B-Diaphragm
- C-Pressure chamber
- D-Pressure relief
- E-Solenoid
- F- Output side

**2.3 SOLENOID VALVE:**

**III. STUDY OF REPAIR METHOD**



**IV.WORKING :**

The pneumatic liner puller is operated by using the compressed air. The compressed air is first sent into the solenoid valve and the valve controls the flow of air and it sends the air into the junction box. The junction box distributes the air and sends it to the double acting cylinder which is placed. As in which the air is injected into TDC of the cylinder the cylinder moves top ward. After then the inlet air is send into the BDC the cylinder moves in opposite direction. The puller plate is attached to the double acting cylinder bottom it helps to remove the liner which is placed in the cylinder block. When the air flows in all cylinder the multi

liners can be removed at same time since the air flows in single cylinder it can help to remove only that damaged liner from the block.

**4.1.MERITS**

- Low cost of production.
- Air is easily available.

- Not much skilled labour is required.
- Easy to operate.
- Required less space.

**4.2.DEMERITS**

- There may be some leakage in hoses

**4.4.APPLICATION**

- Automobile workshop
- Engine replacement shop

**v.CONCLUSION**

The conclusion is to provide that the fabricated pneumatic liner puller helps to remove the multi liner at a time or a damaged liner at time. And the pneumatic liner puller works in out at a low pressure and also it can be manufactured at low cost. So that it can be used workshops for the replacement of the cylinder liner and it could be more useful.



Fig-6 Pneumatic multi cylinder liner puller

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## REFERENCES

1).AkiiOkonigbonAkaehomenIbhadode , (Jan. 2011), "Design and Manufacture of 30 ton hydraulic press", Mechanical Engineering Department, Federal University of TechnologyYola, Admawa State Nigeria; A.U.J.T. 14(3): 196-200.

2)Tolomatic Pneumatic Actuators. Tolomatic. Retrieved

May 3, 2011

3) Pneumatic Cylinders - North America. Parker Hannifin.

Retrieved May 3, 2011.

4) Hibbeler, R.C. (2007). Engineering Mechanics: Statics(11 Ed.). New Jersey: Pearson Prentice Hall. ISBN 0-

13-221500-

5) Volvo Trucks North America, Inc. This TSI Service Bulletin replaces TSI 213-002, "Cylinder Liner, D12, D12A, D12B, D12C" (11.2001), publicationno.PV776-TSP160571 Cylinder Liner..

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