

PLC Based Leak Test Machine for Shock Absorber Tube- A Survey

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Abstract - Leak testing machine is a special purpose machine and it will be specially design and manufacture to observation and analysis of minor leaks in shock absorber tube which is Automotive Component. Now a days user observation and checking method is manual i.e. operator is visually checks tubes. Because of this there are some field concerns find in shock absorber and due to this reason they need some special machine to carry out this operation. This machine is a combination of electronics, electrical and pneumatic like PLC, SMPS, single filters, MCB's, solenoid valves, pneumatic cylinder, air FRL unit, air buster, digital pressure, switches, reed switch sensor, optical sensor, push buttons, indication lamps, digital counter, etc. Basically operating system for this machine will be as; Lock shock absorber tube by using push button i. e. cycle start then feel air in shock absorber tube for reset time. Then cut air supply now check air drop by using feedback system through digital procedure switch. If the tube is leak then the pressure will be drop and digital pressure switch gives digital input in PLC. According to PLC program logic PLC gives result output with indications either the tube is leak or not and this will insure the rejection of tube from in field.

Keywords – PLC, Shock Absorber Tube, Leak Test, FQA.

1. Introduction

Leak testing machine is a special purpose machine (SPM) and it will be specially design and manufacture to observation and analysis of minor leaks in shock absorber tube which is Automotive Component. Now a days user observation and checking method is manual i.e. operator is visually checks tubes. Because of this there are some fields concerns find in shock absorber and due to this reason they need some special machine to carry out this operation.

2. History and Development

In Shock Absorber Testing process, Leak test for Shock Absorber is carried out. This test is done manually by operator by inspecting and checking by visual inspection. Operator has to check all inspecting points of Shock Absorber Tube which takes time. After test and tube marked as tested OK still some tubes found leaked at the final testing of Shock Absorber. This problem occurs due to manual testing by the visual inspection.

3. Literature Survey

Pneumatic shock absorber and nitrogen air based shock absorbers are used in contact with springs. In automobile shock absorber springs are check valves and orifices to control the flow of oil through an internal piston. In early day most of the shock absorbers, energy is transmute into heat inside the fluid. In hydraulic cylinders, the hydraulic (i.e. water or oil) fluid can be heated, while in air cylinders, the hot air is usually haggard to the atmosphere. In some other types of shock absorbers, this electromagnetic types, the dissipated energy can be stored and it can be use further. In simple terms, shock absorbers help in vehicles on rough roads.

In automobiles, shock absorber tubes helps to reduces the effect of traveling over grim ground, leading to improvement in riding quality and automobile handling. While shock absorber tubes gives the purpose of limiting movement of suspensions in shock absorber, their purpose is to control spring oscillations movement in the suspension. Valves of oil and gas in shock absorbers are

used to absorb excess amount of energy from the springs. Spring values or its types are chosen by the manufacturer based on its applications and the specifications of the automobile which are loaded and unloaded in the system. Along with hysteresis in the tire itself, they moist the energy stored in the motion of the unspring in the system gets weight up and down. Effective wheel movement control may require tuning shocks to an optimum resistance to get accurate results.

Spring-based shock absorbers tubes are mostly uses coil springs, though twin or double bars are used in compress shocks as well. Ideal springs, are not shock absorbers, as springs only store and does not absorb energy. Vehicles having both hydraulic shock absorbers and bars or springs exercise. In this scenario, "shock absorber" refers specifically to the hydraulic piston that absorbs and reduce vibrations.

3.1 Hydraulic Shock Absorber Tubes

Nowadays, hydraulic shock absorbers are less used in today's automotive industries. From a technical view, this type of damper is a poor solution, because the oil contains approximately 10% air. Under imposition of the air and oil molecules separate from each other, resulting in a noticeable drop in the controlling force - on longer traveling on country roads and metro ways, a loss of up to 35% controlling force can be measured. That means the wheels provide poor and bad road holding; only when the system stops it does the damper regain in its full force and again vehicle provide its original driving performance.

3.2 Gas Pressured Shock Absorbers Tubes

With the help of gas pressure shock absorbers tube, the losses in the damping force does not appear in the system. The use of nitrogen gas pressure tubes ensures that the shock absorber tube oil is goes on permanently under pressure, therefore preventing froth, even in the under load condition. As a result, the operating performance of a vehicle connected with the air pressure shock absorbers tubes can be precisely defined and safety provided to it, whatever the condition; this establish a substantial bonus in terms of safety.

Air pressure shock absorbers tube are available with either single tube or twin tube technology. The twin-tube system represents top-most technology at an catchy price. The single-tube system, this is the technology used in motor sport bikes or cars and on standard sports cars. The larger proper area of the movement in the working piston gives that greater controlling force and better handling

performance. With the help of discharge of thermal energy into the atmosphere energy means consistent in high performance can be achieved and the better design provides us to maximum safety reserves in flexible fitting conditions, e.g. inverted technology. The inner tube used in shock absorber can be shown in fig 1.



Fig 1: Inner tube of shock absorber

3.3. How A Shock Absorber Tube Works?

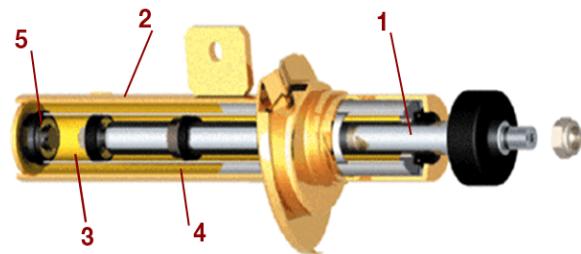


Fig 2: Shock absorber

In the manufacture of its shock absorbers, Gabriel company only uses the more resistant twin-tube technology which constancy to OE fitments. As the name suggest, in a twin-tube shock absorber, there are two actual tubes. Piston having two parts, One forms the outer body of the shock absorber tubes and the second form is a cylinder inside in where the piston moves. Tiny holes in the piston rod and valves connected in between the inner and outer tubes restrict the flow of oil to control wheel movement or motion.

Gabriel manufactures hydraulic shock absorbers tubes[1] (which utilize oil) and gas shock absorbers (which utilize gas). Rather than actually absorbing shocks, the real purpose of the shock absorber tubes is to keep the wheels of the car in contact with the road, and dampen the spring movement. This is derived by the scientific principle of transference. The energy produced by the spring is transferred to a piston rod in chamber that is filled with oil and the energy gets dissipated into heat form. The twin-tube system shows the basic design of a modern technology shock absorber tubes.

The piston rod [1] and protective tube are fixed via the mounting flange to the car body. The cylinder [2] is fixed to the wheel suspension. The internal tube [3] contains the working chamber in which the piston moves upward and downward in the direction. The system chamber [4], between the inner and the outer tube of shock absorber, is filled with oil and air and contains the extruded oil volume caused by the piston rod when moving downward direction. Valves, fixed in the plunger, controlling the flow of oil at different rates. As the plunger moves upward direction, oil is sucked back out of the system chamber through the base valve. The twin-tube shock absorber has to be installed with the plunger rod at the top, as otherwise air would be drawn out of the system chamber, which would cause the oil to froth and the damping to fail.

Generally, shock absorbers has two things. Apart from control the movement of shock absorber tubes i.e springs and suspension, shock absorbers also keep to controlling your tyres position when it is in motion in contact with the ground level at all times. At starting condition or in driving condition, the surface of your tyres is the part of your car in contact or in touch with the road. When at a time that vehicle tyre's contact with the ground is reduced in size, your skill to drive the car, steer and brake is severely compromised. Shock absorbers tubes don't support the vehicles weight.

Firstly, a little bit of science. Shock absorbers working as motion of your suspension tubes and converting it to thermal energy that is then scatter into the atmosphere through the mechanism of heat exchange. But it's nowadays near as complicated as it may sound created in the system. Shock absorbers are basically oil pumps. A piston is connected to the end of a rod and works against hydraulic fluid present in the pressure tube. As the suspension moves upward and downward direction, the hydraulic fluid is forced through tiny holes present inside the piston rod. Because the tiny holes only allow a small amount of fluid present in the piston rod, the piston rod is

working in slow condition which in turn slows down spring and suspension movement of the rod. Working of shock absorbers can be automatically adjust to any conditions of road because of the faster movement of suspension, the more resistance they provide for system.

In [5], different electronics sensors has used for live load monitoring, use can use this sensors to measure different analog sensor data which can be connected to micro-controller for further process.

Table 1: Review Table

Parameter	Description	Error	Solution
Visual or Manual technique	Operator is observe or checks the tubes	Some field concern find in shock absorber	Special machine required to operator
Water Testing	Putting tube in water, if there is leakage, then bubbles are coming out.	If there is minor leakage, we can not identify the problem as well requires more time to diagnose.	Water level sensor or air sensor should used to get accurate or faster result.

4. Conclusion

Due to manual testing the system is less accurate and also takes time. At the final FQA it is found the tubes have leakage and rejected by FQA to remove/replace the tube. The aim of the project was to address the pressing challenges of increase production rate with more accurately and efficient operation of Leak testing machine. Leak testing machine is a special purpose machine and it will be specially design and manufacture to observation and analysis of minor leaks in shock absorber tube in which we increase the production rate. If any failure occurred in hardware then work done can carried out manually. As shown in Table 1, we come across the difficult parameter of tube testing and we obtained solution upon it. Hence we achieve all our objectives and overcome all the drawbacks we have seen in trial and error experiment.

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