Auto Testing of FCPV and ADC Joint Air Leak Detection Using PLC

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ABSTRACT: Most vehicles involved in accidents now a days are the big vehicles like lorries, buses and trailers. Their braking system is quite different from the small cars. They have air tank for their braking system and hence the amount of air required is tremendous. Air braking system uses air as a way of transmitting pressure from the drivers control to the service brake. This compressed air has some water which cannot be compressed. The more water in the tank the less the compressed air volume is. Whenever the foot brake is applied, large amount of air is used. If the air pressure does not build up fast the pressure may drop to low if leak is present in the system which affect the efficiency of entire braking system of vehicles. A leak can be defined as an intended crack, hole or porosity in an joint which must be excluded from the system. A leak test procedure is usually a quality control step to assure device integrity and should preferably be a onetime non-destructive test, without impact on environment and operators. The three basic functions of leak testing are leakage detection and its location, measurement of leak rate.One of the test presently used in industry is soap solution bubble test. The pressurized unit to be tested is sprayed with a soap solution and the operator is able to see the bubbles formed by gas escaping from where the leak is, the more the bubbles the larger is the leakage .If the part is not simple and easily accessible it is difficult for operator to perform above mentioned test, also the test is time consuming, affecting the efficiency, accuracy and productivity of system. To overcome the disadvantages of the above mentioned system we are implementing pressure decay test using PLC which would determine air leakage between ADC(Air Dryer cartridge) and FCPV(Four Circuit Protection Valve) joint to improve the braking efficiency of vehicle system.

KEYWORD:-PIC, FCPV, ADC, Leak Detection.

I. INTRODUCTION

In today's world Automation plays an increasingly important role in the global economy and in daily experience. With the rapid development in technology, the more focus is on selection of application oriented Controllers and tools. Hence we are implementing the concept of Auto testing of FCPV and ADC joint Air leak detection using PLC'. This project explores the Pressure monitoring technology and its use for developing automation for vehicle systems. Earlier the monitoring of the process of done by human using soap bubble test to detect pressure leakage which caused a huge error which in turn caused heavy losses. To reduce this loss, automation is developed using PLC.In this project ,we are working on the measuring and monitoring the pressure in ADC(Air Dryer cartridge) and FCPV(Four Circuit Protection Valve).Here, we are using the analytical instruments which give all the information about pressure &its level in job.In this project, we are using Tecomech type PLC, digital pressure gauge, and ADC & FPCV joint, pneumatic cylinder. Here PLC is a main controller which takes input from pressure gauge& passes this pressure to the joint. Pressure will be allowed to be stabilized in the joint and then the leakage will be observed on the gauge. Then accordingly decisions are made weather the present job is ok or not and corresponding indications are given to the operator.

II. LITERATURE SURVEY

For measurement of leak detection we are using the pressure decay test. for that purpose we required to select the components. The PLC is used for making the whole system automate. In core industries all the systems are automated and they want to reduce the manpower and time. Recently they are using the soup bubble test for detecting the leakage.

This technique is not very accurate and efficient so we go for pressure decay test. So, that we are selected the techomech PLC which having online monitoring and online editing facility. According with this the pressure sensor PTX1400 is selected for measuring the pressure. The PTX/PMP 1400 Series of Industrial Pressure sensors have been designed for use with aggressive pressure media found in many industrial and process applications. The stainless steel isolation diaphragm and fully welded stainless steel pressure module ensures excellent media compatibility without compromising the performance from GE's own micro-machined silicon pressure diaphragm.

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: 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. Multiple solenoid valves can be placed together on a manifold. The Burkert Type 0121 is a high quality, direct-acting 2/2 or 3/2 pivoted armature solenoid valve that can be used in a wide range of applications for opening, closing, dosing, mixing, and distributing. The separation between the magnetic system and the medium chamber consists of an intermediate separating diaphragm system. The valve is particularly suitable for aggressive media. The Precision Digital Pressure Gauge CPG1000 takes the concept of an analog test gauge, and brings it to a new level, as only digital calibrators can do. The CPG1000 combines the accuracy of digital technology with the simplicity of an analog gauge, and achieves performance, ease-of-use, and a feature set unmatched in the pressure measurement world. Pneumatic cylinders sometimes known as air cylinders are mechanical devices which use the power of compressed air to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage.

III. DESIGN

The pressure decay test is implemented to check the accuracy of the system. This is an important part in an industry to maintain the accuracy and the quality of the product. The product for which we are implementing this pressure decay test was used in the commercial vehicles for breaking purpose. The 100% accuracy in breaking is the main aim of the industry, for that purpose we are checking the leak in product. The PLC is used for making the system automated.
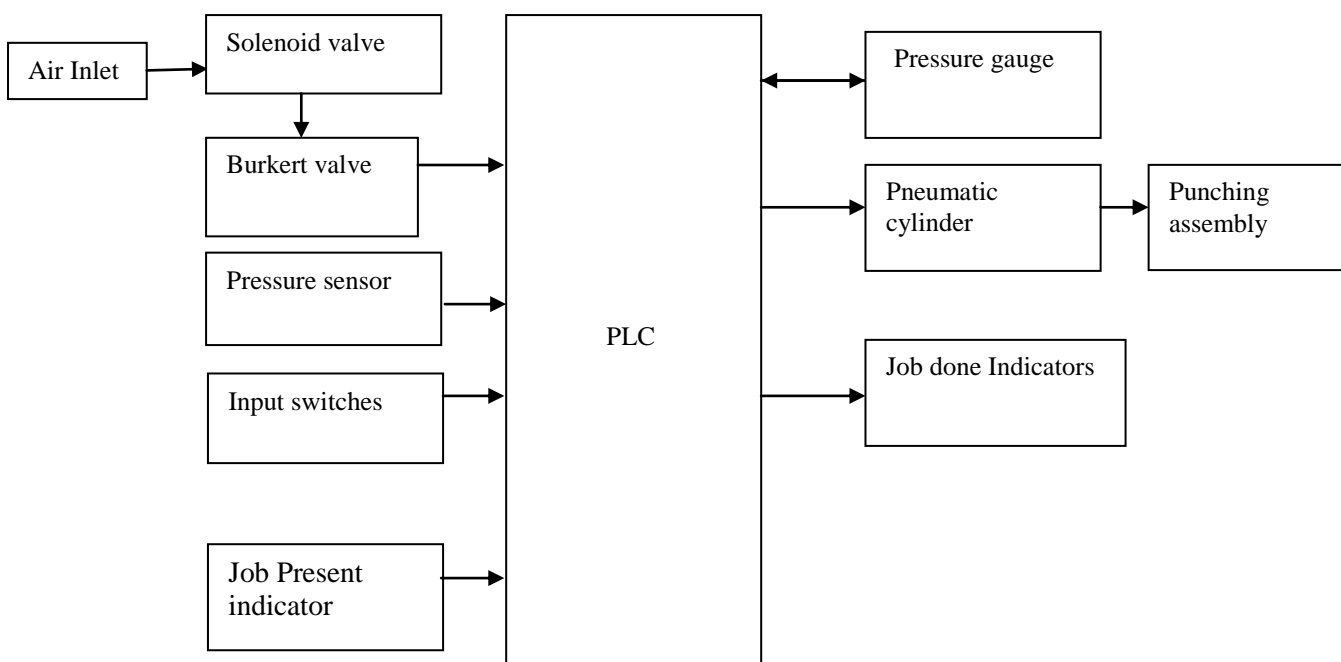By using this system the manpower and time required is reduced.

Fig.1 Block diagram

A. Description

Here, the assembled job of ADC and FCPV are kept on fixture and four ports of FCPV are blocked by adapter. This method consist of pressurizing a job with high pressure gas usually dry air from input valve then job is isolated from air supply and, after a stabilizing period, its internal pressure is monitored over a time and pressure is displayed on screen of pressure gauge. We are using two input push button switches for start and stop.

The pressure is allowed to be stabilized in the joint and then the pressure will be monitored with the help of pressure gauge. If the pressure in the system drops fast, there is a large leak present in that job. If the pressure drops slowly there is small leak present and if pressure remains same that job is leak free.

PLC will give alarm for Job is not ok and if the pressure drop is zero for entire stabilization period, PLC will give alarm for Job is ok and then Job will be sent to the punching module which would be undertaken by pneumatic cylinder using automation.
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B. Design of programs

 According to the process of the work to undertake, the programs of the main PLC system are designed in a CodeSys software. We are use the ladder diagram for implementing of the software. CoDeSysis a complete development environment for your PLC .CoDeSys stands for Controlled Development System. CoDeSys puts a simple approach to the powerful IEC language at the disposal of the PLC programmer. Use of the editors and debugging functions is based upon the proven development program environments of advanced programming languages (such as Visual C++).

IV. RESULTS

Following figures shows simulation results for start, job ok, job punching, and job not ok conditions.
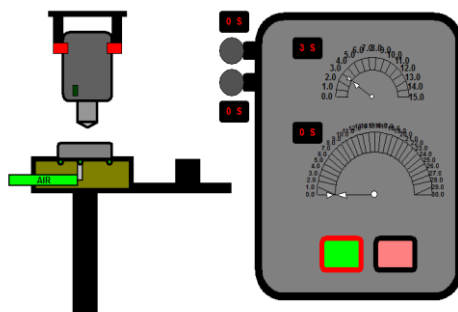

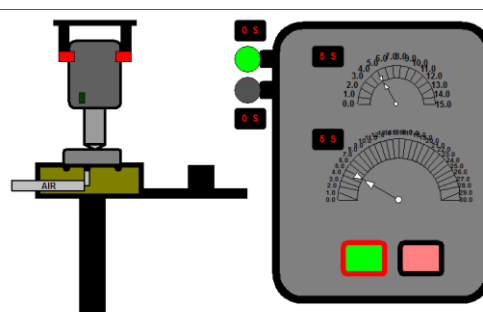Fig.2 Push the start button for filling the air in the job

Fig.3 If job Ok then green indication is ON and start pneumatic cylinder for punching the job
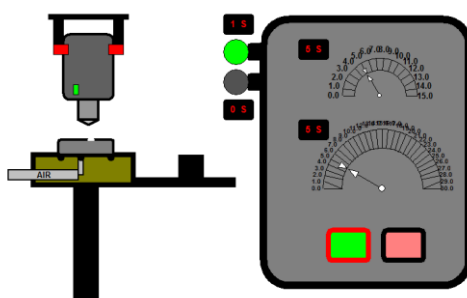

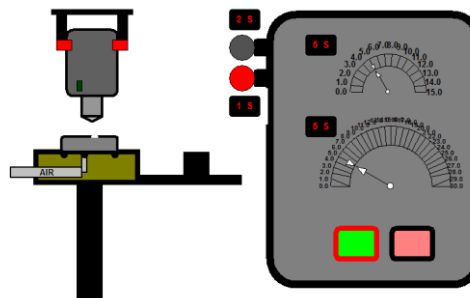Fig.4 After 2sec piston in pneumatic cylinder goes its original position

Fig.5 If job is NOT OK(leak will be detected)red indication is ON

V. FUTURE SCOPE

In the existing system, the job is placed manually. It will consumes some time, So for making system more reliable we are placed whole system on the conveyer belt or assembly line.

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VI. CONCLUSION

This automatic system will positively identify weather a leak exists or not by monitoring a pressure drop and if there is minute pressure drop then leakage is exist. This system will detect over 100 percent of defective parts. As the efficiency and accuracy of leak detection increases this system has applications where the leak detection is to be identified.

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