AUTOMATIC CONTROL OF PNEUMATIC TRAINER USING PLC

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ABSTRACT

Electro pneumatic is successfully used in many areas of industrial automation. Production, Assembly of packaging system and also sequence of operation worldwide are driven by pneumatic control system.

In old days, pneumatic used only manually but in recent days it is operated automatically by using PLC .In our projects we can use only few components like solenoid coil ,PLC ,relay ,proximity switch ,smps ,FRL, directional valve and cylinder using these component we can make the electro pneumatic panel.

Our circuits are based on 24v dc and working pressure was up to 8bar.The following chapter's shows approach to project planning and the implementation of electro pneumatic trainer kit. Finally, we had a positive approach towards our project.

KEYWORDS: FRL (Filter regulator and lubricator), PLC, Solenoid Valves, Relay

INTRODUCTION

The Pneumatic is successfully used in many areas of industrial automation. Pneumatic Trainer facilitates the student & the industrial professionals to explore the fundamental of 'pneumatic'. It tells how one device can be used to manage, command, direct or regulate the behavior of other system.

Pneumatic is a branch of science that is related with Air. In pneumatic the working medium is "compressed Air". Now- a- days this working medium is becoming very popular in industries like chemical, petroleum, food & beverage, robotics, machine etc. The reason for being so popular is that it is fire free & nonhazardous to our Environment. It is very easy, simple & safe to operate. The feature of pneumatic trainer, it has both manual & automatic based control. The pneumatic trainer kits are known for their accuracy & precision. The pneumatic trainer provides different types of valves such as electronic & mechanical.

PROPOSED WORKING

- In this system we can used proximity sensor, from this proximity sensor the direction of pressurized air can be control.
- Here we also use the solenoid coil to energies the solenoid valve, when the solenoid valve is energies, then the flow of pressurized air can be happened.
- As the input to the PLC we can use the output of proximity sensor and the output of PLC is connected to the Relay circuit.

When the proximity sensor sense the position of piston then it gives single to the PLC, The PLC can supply this input to the relay coil, Relay coil energies the solenoid coil and solenoid valve can be operated. This process is repeat at instant till we cannot turn off the supply.

Features of component:
- 24 volts DC Delta PLC (14ss2).
- 230 volt AC to 24 volt DC Converter.
- 24 volt Dc operated proximity sensor.
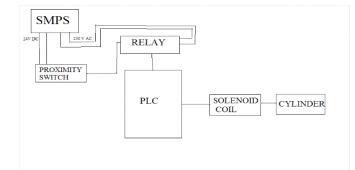- 24 volt DC single channel Electromagnetic Relay.

BLOCK DIAGRAM

Fig.1 Block Diagram

WORKING

On the main supply using the push button, proximity sensor can sense the backward position of piston present in cylinder. The output of the proximity switch give to the plc, The plc can sense the input and passes signal to the relay and the relay coil can be energies   and operate NO switch as a NC so 230v supply is given to the solenoid coil. And solenoid valve can be energies and passes compressed air to the cylinder. Then piston move to the forward direction Similarly when forward position can be sense by second proximity sensor then the second output of plc get on and passes signal to the second relay and these relay is connected to the another solenoid coil. So the air flow is reverse so piston get backward direction, These process can be continue until the we cannot disconnect the main supply.

LADDER DIAGRAM: ladder diagram, the contact symbols represent the state of bits in processor memory, which corresponds to the state of physical inputs.

PIPE CONNECTION: Firstly connect the compressor to the FRL unit then from the FRL unit 5/2 distributor valve is connected to the pipe and these distributor output connected to the solenoid valve, from the solenoid valve double acting cylinder is connected.

WIRING CONNECTION: From the main supply 230v ac gives to the manual operated switches, from these switches solenoid coil energies. If a discrete input is energized, the memory bit is a 1, and a "normally open" contact controlled by that bit will pass a logic "true" signal on to the next element of the ladder. Therefore, the contacts in the PLC program that "read" or look at the physical switch contacts in this case must be "opposite" or open in order to return a TRUE for the closed physical switches. Internal status bits, corresponding to the state of discrete outputs, are also available to the program. A complete program may contain thousands of rungs, evaluated in sequence. Typically the PLC processor will alternately scan all its inputs and update outputs, then evaluate the ladder logic; input changes during a program scan will not be effective until the next I/O update. A complete program scan may take only a few milliseconds, much faster than changes in the controlled process. Programmable controllers vary in their capabilities for a "rung" of a ladder diagram. Some only allow a single output bit. There are typically limits to the number of series contacts in line, and the number of branches that can be used. Each element of the rung is evaluated sequentially. If elements change their state during evaluation of a rung, hard-to-diagnose faults can be generated, although sometimes (as above) the technique is useful. Some implementations forced evaluation from left-to-right as displayed and did not allow reverse flow of a logic signal (in multi-branched rungs) to affect the output.
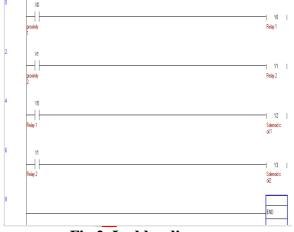
Fig.2 Ladder diagram

When the position of piston can be sense the first proximity switch then the first NO switch can be operated as a input, respective relay output can be on. in the programming of plc one arrangement can provided that is the no output can be use as a input so we can use output of relay as a input. This input give to the respected to the solenoid coil, similarly for the second proximity. For the protection of the system we can connect alternate NC switches of the proximity sensor in the series with NO switches.

RESULTS

In Electro Pneumatics, the signal medium is the electrical signal either AC or DC source. Working medium is compressed air.

The manual operated pneumatic trainer kit is very costly and the loss of air pressure is can be drop in the switches use for the working. In this project we can reduces the cost of trainer kit and also reduces the loss.

After completion of project, Give the Electrical connection and regulating the pressure from 0.15 MPa to 0.8 MPa it was found that the valves were behaving the sequential order given to them through the push buttons. No short circuit was observed in any of the electrical wirings while working on it. Proper earthling was insured for safety of parts and for operator also.

Operating voltage from around 24 volt Dc and 230 volt AC supply is used. The final control of valve is active by solenoid actuators. Control of electro-pneumatic system was carried out by using combination of relay and push buttons. To convert the position sense by the sensors to the output for solenoid coil relay is used. Finally the supply is given to the solenoid coil and working is control.

CONCLUSION

This Paper Present, The user can set the automatic operation of electromagnetic cylinder. This system has facility to sense the position of piston and from this sensing input work automatically. System will control the position of piston, i.e. if position is at forward direction then the sensor will sense it and passes the single to the PLC then PLC gives command to the relay and relay will energies the solenoid valve and the piston get backward direction.

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