

Study on Response time of Roller Type Limit Switch with Reed Type Limit Switch in Pneumatic Automation

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Abstract: The original work of comparing the performance of Reed Type Limit switch with the Roller Type Limit Switch was done at the Process Automation Laboratory available in the Mechanical Engineering Department of VSVN Polytechnic College.

The Automatic operation of Double Acting Cylinder was done using Basic Pneumatic Circuit with Mechanically Roller operated Limit switch. The time taken for completion of 10 cycles of the Pneumatic Circuit (Response Time) is measured for various Air Pressures. (2Bar, 3Bar & 4Bar)

Similarly, the Automatic operation of the Double Acting Cylinder was done using PLC Circuit with Electrical Reed type Limit switch. The time taken for completion of 10 cycles of the Electro Pneumatic Circuit (Response Time) is measured for various Air Pressures. (2Bar, 3Bar & 4Bar)

The same circuits are also made using FluidSim Simulation software and the operation characteristics curves were plotted using the above Software. Based on the original data & simulated data, the inferences are discussed in this paper. The above study would be useful in selecting the type of Pneumatic Automation that can be utilized for various industries.

Index Terms: Basic Pneumatics - Roller Type Limit Switch, Electro Pneumatics – Reed Type Limit Switch, Response Time.

I. INTRODUCTION[

The Automation Laboratory of our Department is Equipped with FESTO Pneumatic Trainer Kit. It has all equipments to carry out the exercises on Basic Pneumatics, Electro Pneumatics and PLC.

The idea & the case study analysis was possible only by virtue of it. Identical supply source, and double acting cylinders of same bore & stroke length are used for the study. Only the limit switches and the method of activation (Pneumatic / Electrical) is

varied between both the circuits. The experiment is carried out and the response time were noted. Based on the experimental results and the simulation results, valid inferences are made.

II. PROCEDURE FOR STUDY

The circuits are made for Basic Pneumatics using Roller type Limit switch and Electro Pneumatics using Reed Type Limit switch. While fixing the components on the Panel Board, care has been made to see that the stroke length for both the circuits are exactly the same. The arrangements made are shown in Fig 1.



Fig 1.

The Direction control valve used for Basic Pneumatic circuit is Pilot operated 5/2 DCV. It is operated by Pneumatic pressure. The Direction control valve used for Electro Pneumatic is Solenoid operated 5/2 DCV. It is operated by Electrical pulse.

Comparison of the 5/2 DCV



Fig 2.

Both the 5/2 Direction Control Valves used in the study are compared in Fig 2 The Logic for automatic operation is written using PLC Ladder Logic and downloaded. The time to complete 10 cycles using Basic Pneumatics and Electro Pneumatics for various supply pressures were compared.

III. RESULTS & DISCUSSION

Initially before experimenting, the authors assumed that the Electro Pneumatics would be faster and the response time would be very short. But on experimenting, the data obtained are tabulated in Table 1.

Table 1.

Pressure	Time taken for completion of 10 cycles in Basic Pneumatics (Seconds)	Time taken for completion of 10 cycles in Electro Pneumatics (Seconds)
1 Bar	2.34	3.18
2 Bar	2.06	2.35
3 Bar	1.68	2.06

It can be observed that the time taken for completion of 10 cycles in Basic Pneumatics is less than the time taken for completion of 10 cycles in Electro Pneumatics. This is true for all pressures. (1 Bar, 2 Bar, & 3 Bar). Fig 3. (Graph) below exhibits the fact clearly.

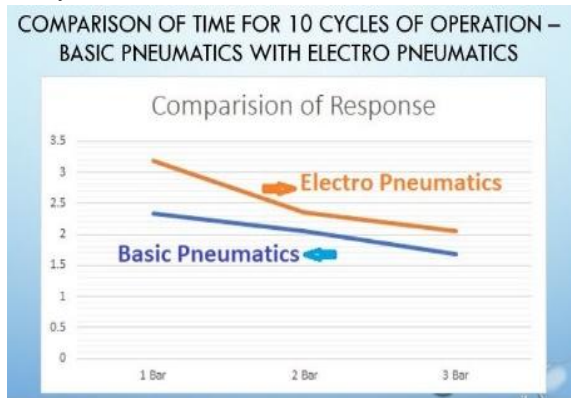


Fig 3.

IV. SIMULATION STUDY

In order to confirm the results obtained, the same circuits were made using fluidsim software. The Roller type limit switches are names as LS1 & LS2 in the circuit. The Reed type limit switches are names as LS3 & LS4 in the circuit. For the specified time, the number of cycles were observed. The simulation Run screen is shown in Fig 4 below.

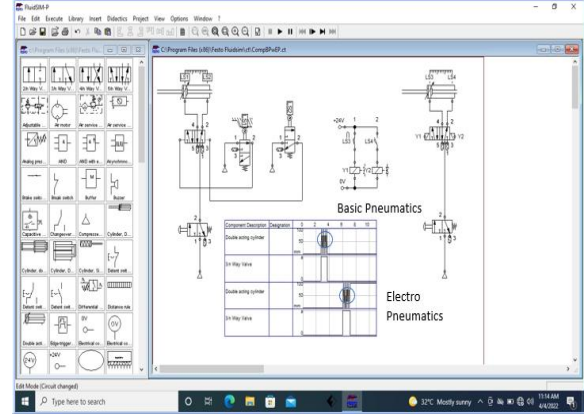


Fig 4.

The Simulation Run was made for the Basic Pneumatics and Electro Pneumatics by setting the same pressure values. From the study it is very clear that the number of cycles per unit time in Basic Pneumatics is more than the number of cycles per unit time in Electro Pneumatics.

V. CONCLUSION

From the study made, it can be concluded that if the drives and controls are within a short span of distance, then the Basic Pneumatics would be the fastest and the Response time is very less. This is because air itself is employed in activation and the conversion time is nil.

Where as in Electro Pneumatics, air pressure is converted into Electrical Pulse and the Electric Pulse is employed in activation. As the conversion takes a bit time, the process is comparatively slow. And if the distance between the drives (Cylinders) and the Control (DCV) are larger, then Electro Pneumatics would be faster as Electrical Pulse travel in wire much faster than the air flow in tube.

ACKNOWLEDGMENT

We express our sincere thanks to the Management of VSVN Polytechnic College for providing excellent infra structure with all equipments and accessories for Process Automation Laboratory. Even after an investment of 30 Lakhs for this Lab, still they are supporting for the upgradation of the Lab & Maintenance of all Equipments. All are imported machines from Festo, Germany & Bosch, USA.

We extend our thanks to our Principal, who have been supportive in establishment of this Lab & also gave us an opportunity to organize FDP for

faculty members with the Lab facilities. Based on the study made in the Automation Laboratory and by analyzing the original data gathered from the study, we have presented the findings in the International Conference, organized by Kamaraj College of Engineering & Technology, Virudhunagar. The same findings were also published as an article in this Journal. Our sincere thanks to one and all for their kind supports.

REFERENCES

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