

Utilization of Low Cost Automation (LCA) by Implementing Electro-Pneumatic System in Industries for Printing Codes and Dates on Manufactured Bottles for Better Production Rate and Reduction of Labour Work

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Abstract

The systems and circuits commissioned in the initial stages of industrialisation are based on mechanical transmission. These technologies has further increased its scope and acquired the scintillating part in the world. Our work is based on the current technical changes undergone by the industries. A likewise technology is presented in this paper, which makes the use of both electronics and mechanical technologies as its constituents. Our work comprises of electronic circuit which guides the mechanical part movement with the help of Pneumatics. It includes the controlling of Pneumatic piston using electronic valves, which reduces the complexity of mechanical elements and controlling the leakage of oil. This technology is implemented to achieve smooth and increase the productivity. The research is performed in fluid sim-Pneumatics 5.0 and respective graphs of different actuation elements are recorded. The final result of our research is to implement the low cost automation (LCA) in industries for the better production rate.

INTRODUCTION:

Low cost automation involves the introduction of standard equipment, mechanisms and devices to convert manual operations to automatic ones. Investment cost is low, as the term itself implies, and the ROI in terms of improved productivity and better work efficiency is high. LCA may best be paraphrased as “simple automation”.

Fluid power and its scope:

In industry we use three methods for power transmitting power from one point to another.

- (1) Mechanical transmission through shafts, gears, chains, belts, etc.
- (2) Electrical transmission through wires, transformers etc.
- (3) Fluid power is through liquid or gas in a confined space.

Fluid power is a technology that deals with the generation and control of forces and movements of mechanical elements or a system with the use of pressurised fluids in a confined space.

Fluid power system includes a pneumatic system and hydraulic system. Pneumatic system employs a compressed air performing the work and hydraulic system employs pressurised liquid, petroleum oil, synthetic oil, to perform the work.

Merits of fluid power system (FPS):

- (1) FPS is simple, easy to operate and can be controlled accurately
- (2) We can start, stop, accelerate, decelerate, reverse or position change with great accuracy using simple levers and push buttons.
- (3) Multiplication and variation of forces.
- (4) Multi-function control.
- (5) Constant force (or) torque.
- (6) Economical.
- (7) Low weight to power ratio.
- (8) FPS can be used where safety is of vital importance.

Electro-Pneumatics:

Two important services to industry are electricity and compressed air. Some machines are powered with compressed air only, and they are efficient and reliable. Also machines are powered with electricity only and they too are efficient and reliable. However, there are times when it becomes convenient to combine electrical controlled

to pneumatic machines for many reasons such as

- a) Remote controlled of pneumatic machines.
- b) Electrical (Electronics) sensing systems may be required, example photo electric sensors.
- c) Very accurate timing may be required and electrical timers are very accurate.
- d) The machine may have mixture of electrical actuators (motors) and pneumatics cylinders.

There may be other reasons. However, even though a machine could be controlled with an all air sending system and also the machine may be controlled electrically, it is often left to the designers own particular taste and resources. Further, the design of a machine is often governed by the financial side of the business.

An important aspect in the design of a machine is to be consistent i.e. if the machine can be fully pneumatically operated then stick to all air or if electrically control is necessary then from a design and maintenance point of view it may be better to have all electrical control. Often machines have electrically and pneumatic equipment combine unnecessarily to make machines unduly complicated.

In this paper a pneumatic counting circuit of A^+A^- up to 5 counts is designed by using double acting cylinder and direction control valves (DCV) with compressed air as working fluid. In an industry when bottles are manufactured they were made to travel on the conveyor to packing section. Before to packing section an automation technology is arranged near the conveyor for printing the manufacturing and expire dates, codes and attaching labels on the bottles by using pneumatic system.

FLUID SIM SOFTWARE:

FluidSIM 5.0 is a comprehensive for the creation, simulation, instruction and study of pneumatics, hydraulics, electro pneumatics, electro hydraulics, digital and electronic circuits. All of the program functions interact smoothly, combining different media forms and source of in an easily accessible fashion. FluidSIM unites an intuitive circuit diagram editor with detailed description of all components and component photos, sectional view animations and video sequences. As a result FluidSIM is perfect not only for use in lessons but also for preparation thereof and as a self-study program.

RESULT:

The electro-pneumatic counting circuit of A^+A^- up to 5 counts is designed and executed in FLUID SIM 5.0 software for simulation and to understand the working of

an automated system. The executed circuit and wave forms in FLUID SIM 5.0 figures are given below.

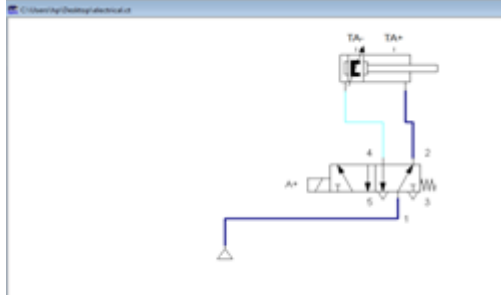


Figure (1): Main circuit

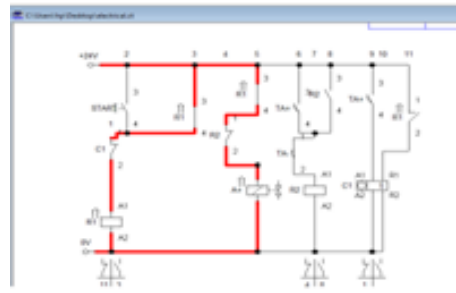


Figure (2): Electro-Pneumatics Circuit

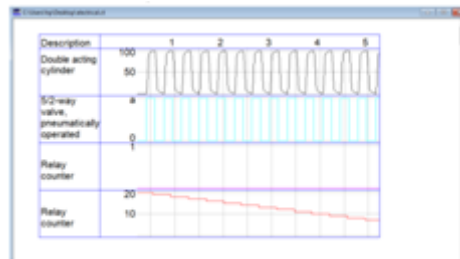


Figure (3) :- Wave forms

Components used in circuit:

- (1) Double acting cylinder
- (2) 5/2 DCV valve (spring return)
- (3) Compressor for compressed air which is used as a working fluid
- (4) Break switch and make switch
- (5) Counters

CONCLUSION

The industrialisation has undergone tremendous changes in the last few decades. They have replaced the old mechanised systems with the automated systems which increased their productivity. These changes have attracted our research criteria. Our research is used to decrease the complex mechanical design and use electronic technology to overcome the mechanical wear and tear. This paper helps to implement mechatronics technology in a specified application. This type of design can be extended for other applications and to implement low cost automation (LCA). Relays

are used to build the circuit and increase the speed of operation to fulfil the productivity of current trend.

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