LOW COST AUTOMATION

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Abstract:

This paper is to introduce low cost automation as it plays a prominent role in the present scenario. The main present work employs a novel approach of automation with minimum cost and greater output efficiency. An example is explained using pneumatic circuit which runs on compressed air where embossing of a body is done. The present work is explained using different components used in a field of science known as mechatronics.

Keywords: Automation, Efficiency, Pneumatic, Embossing, Mechatronics

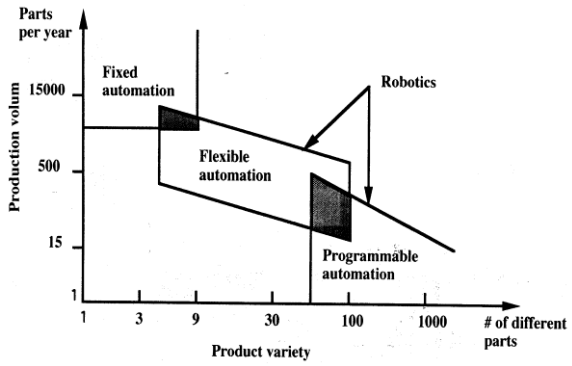
I. INTRODUCTION

Automation is the use ofvarious control systems (system that manages commands, directs or regulates the behavior of other devices or systems) with minimal or reduced human intervention. The term automation, inspired by the earlier word “automatic” was not widely used before 1947, when General Motors established the automation department. The purpose of automation is to free human being from stressed efforts, and to increase the productivity by utilizing available resources in the most efficient manner.Automation has been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronic, and computers, usually in combination. Nowadays most of the processes in industries have been automated.

II. TYPES OF AUTOMATION

Based on production, Automation is classified into three basic types. They are:-

- Fixed Automation
- Programmable Automation
- Flexible Automation



FIXED AUTOMATION (Hard Automation):

Fixed automation refers to the use of special purpose equipment to automate a fixed sequence of processing or assembly operations. Each of the operation in the sequence is usually simple, involving perhaps a plain linear or rotational motion or an uncomplicated combination of two. It is difficult to accommodate changes in the product design. Therefore it is called hard automation. The typical features of fixed automation are

1. Automated material handling
2. High production rate
3. High investment

PROGRAMMABLE AUTOMATION:

In programmable automation, the production equipment is designed with the capability to change the sequence of operations to accommodate different product configurations. The operation sequence is controlled by a program, which is a set of instructions coded. So that they can be read and interpreted by the system. New programs can be prepared and entered into the equipment to produce new products. Some of the features that of programmable automation are

1. High investment in general purpose equipment
2. It is suitable for batch production
3. Lower production rate than fixed automation

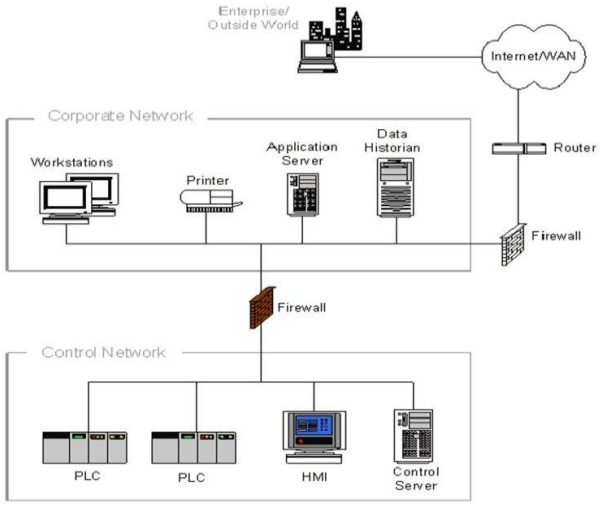
FLEXIBLE AUTOMATION (Soft Automation):

A flexible automation system is capable of producing a variety of parts with virtually no time lost for changeovers from one part to the other. It is an extension of programmable automation. Some of the features of flexible automation are

1. Medium production rate and High investment
2. Continuous production of variable mixtures of product
3. Flexible to deal with product design variation

III. LOW COST AUTOMATION

It is a technology that creates some degree of automation around the existing equipment, tools, methods and people, using mostly standard components available in the market.Low Cost Automation promotes cost oriented reference development approaches that properly integrate human skill and technical solutions. It opposes the rising cost of sophisticated automation and propagates the use of innovative and intelligent solutions at an affordable cost. The purpose of low cost automation is to relieve man of routine tasks so that he can exercise his proper function of making decision. This can be achieved by introducing very simple devices. Use of simple devices utilizing relatively cheap and readily available components, to minimize or eliminate human effort in certain operations is called Low Cost Automation. The often-told reason not to go in for automation is the high costs involved compared to the investment in manpower.



AVENUES OF LOW COST AUTOMATION:

- Solenoid Valves
- Electrical Actuators
- Solid State Switches
- Pneumatic Actuators
- Hydraulic Actuators
- Fluidics
- Hydro Pneumatics
- Electro Pneumatics
- Limit Switches & Electrical Relays

IV. ADVANTAGES OF LOW COST AUTOMATION

1. Improved quality or increased predictability of quality.
2. Increased productivity.
3. Improved consistency of product.
4. Reduced direct human labor costs and expenses
5. Reducing manufacturing lead time and respond quickly to the consumer needs.
6. Provides higher level jobs in the development, maintenance and running of the automated processes.

V. EMBOSSING

Consider a circuit that does embossing i.e. does holes on the work piece. With the help of pneumatic cylinders embossing is done. The process is done electrically with the help of switch box, relay, solenoid valves, delay and power supply unit. The pressurized air is used for the action of cylinders. The above process is used only for small scale industries but in for large scale production, automation is adopted for the process to reduce manual operation. The circuit is inoperable so a relay is used. The equation is as follows:

A+ B+ B- A- C+ C-

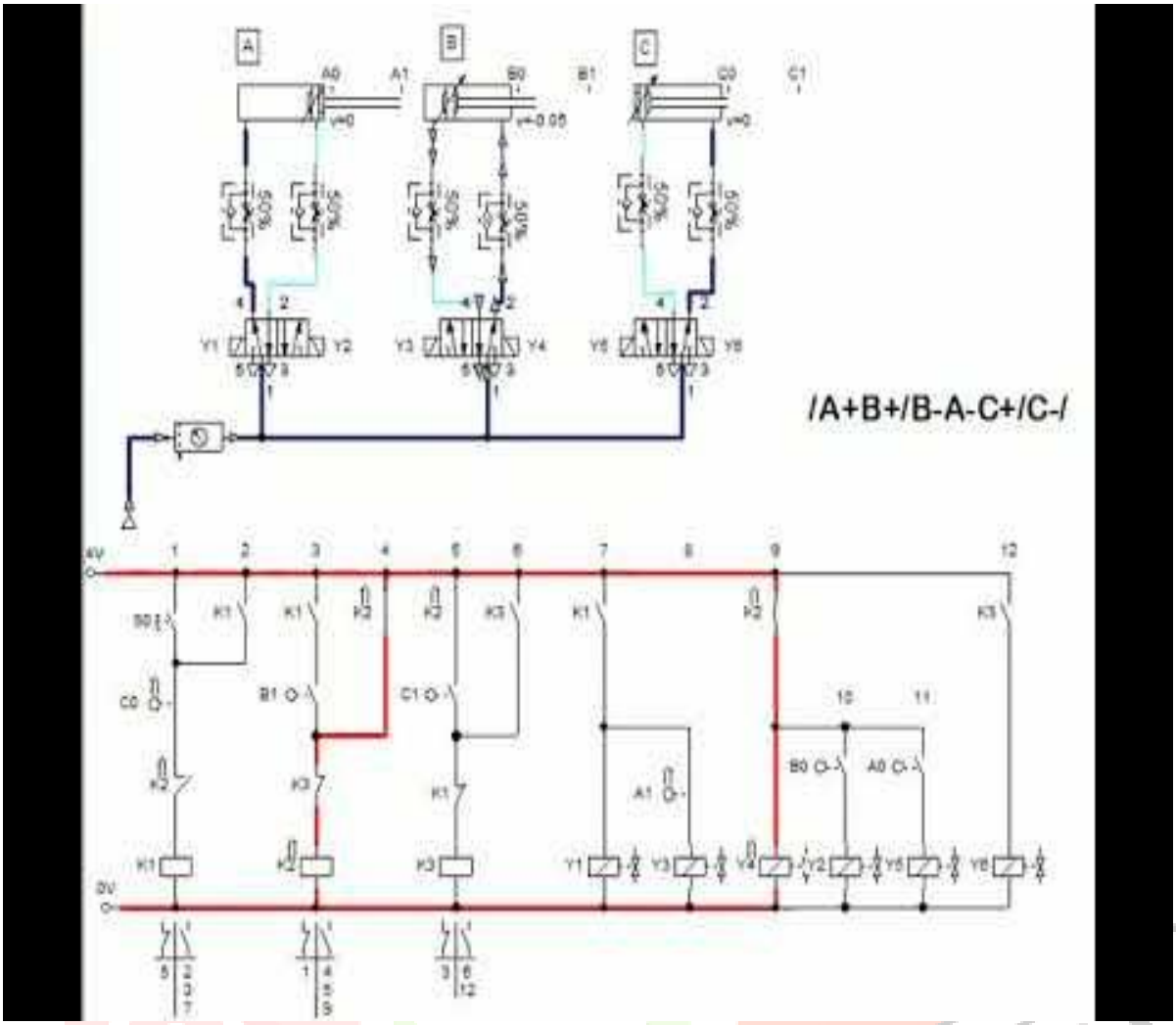
A: 1st cylinder B: 2nd cylinder C: 3rd cylinder

Here:

+ denotes the forward direction of cylinder and

– denotes the return of the cylinder

- A+ does clamping of the work piece.
- B+ does the embossing i.e. makes hole on the work piece by forward stroke of cylinder.
- B- is the process of return stroke of cylinder
- A- doesdeclamping of the work piece.
- C+ does the ejecting of the work piece.
- C- again is the return stroke of the cylinder.



WORKING PROCEDURE:

First work piece is placed in front ofcylinder A. When the connections are made and air is supplied the cylinder A piston pushes the work piece into the slot and clamps it. Then the cylinder B piston moves towards the work piece doing embossing work on it. After completion of embossing the cylinder B completes its return stroke. Then the cylinder A piston completes its return stroke and work piece is freed in the slot. After the return stroke of A cylinder C moves towards the work piece and pushes it outside the slot. Then the cylinder C moves backwards and the process is repeated.

A model of embossing machine

VII. CONCLUSION

The low cost automation is going to be a revolution in future times and is a boon to developing countries. By this there would also be a large jobs incubated for its development, research, maintenance etc. The efficiency of production is greatly increased by automation and therefore time taken for output is greatly reduced. For ex. Maruti Suzuki, a reputed automobile company assemblestotal body of a car in just 18 seconds.

VII. REFERENCES

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VIII. ABOUT THE AUTHOR

A.LohitLokesh is currently pursuing his Master of Technology (Advanced IC Engines) in JNTU Anantapur. He has received his Bachelor of Technology from JNTUACE Kalikiri in the year 2017. He has published one paper titled “Experimental Investigation on Engine Performance and Emission Characteristics of Turpentine Oil Blends with Diesel”.