

# Design And Fabrication of Pneumatically Operated Embossing Machine With Programmable Controller

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**Abstract** – In manual operated embossing machine, hand operated lever is used emboss on workpiece. Embossing work depends on operator i.e. productivity depends on operator efficiency. In manual operated embossing machine operator perform operations like loading workpiece to work holder, operating hand lever to perform embossing, checking whether emboss is performed perfectly, unloading of workpiece and counting of finished workpiece. Thus the loading of workpiece, to operate hand lever and unloading of workpiece will take more cycle time. This leads to increase in manufacturing lead time (MLT) and work in process (WIP). The main limitation of manual operations is it is tedious and less productivity. In fast replication process where mass production requires continuous operation, manual operated embossing machine does not suit hence innovation requires to enhance fast replication continuous mass production. To overcome this problem in manual operated embossing machine, the concept of automation is used. This project involves design and fabrication of pneumatically operated embossing machine with PLC. In this machine operations like loading workpiece to work holder, embossing and unloading of workpiece are performed automatically.

**Key words** – *embossing, automation, plc, pneumatic, automated embossing machine.*

## I. INTRODUCTION

Embossing is the process of giving a three-dimensional look to a material or product. Pressure is applied to the surface of the material and results in an image remaining on the surface of the material. 'Relief' is another term used to encompass the process of embossing.

There are 3 basic elements in achieving an emboss

- Pressure
- Time
- Heat.

It is the combination of these three elements that determine the final quality of the emboss and the variation of these elements in relation to the material to be embossed. Embossing refers to the creation of an impression of some kind of design, decoration, lettering or pattern on another surface like paper, cloth, metal and even leather, to make a relief. In regular printing or an engraving, plates are pressed against the surface to leave an imprint. In embossing however, the pressing raises the surfaces adding a new dimension to the object. Embossing involves the creation of an impression by placing the dies in contact with the stock under high pressure. There are also many different kinds of embossing that can be done like blind embossing, tint embossing and glazing to achieve different results. The process of embossing is relatively inexpensive and has many uses. Embossing is used for aesthetic purposes as well as functional uses in industries. From embossing names on credit cards to embossed Braille books for the blind, embossing has a wide range of applications and uses.

Embossing is cold press working operation in which the starting material is in the form of a blank of sheet metal. The aim of embossing operation is to force impression into the surface of the metal or workpiece. Embossing is a forming operation. Embossing is an operation used in making raised figures on sheet or workpiece with corresponding relief on other side. The die set consists of a die and punch with the desired contours, so that when the punch and die meet the clearance between them is same as that of the sheet thickness. The metal flow is in the direction of the applied force. Embossing operation is generally used for providing dimples on sheet to increase their rigidity and for decoration sheet work used for panels in houses, religious and symbols.

## II. MANUAL OPERATED EMBOSSING MACHINE



In manual operated embossing machine, uses hand operated lever is used to emboss on workpiece. Embossing work depends on operator i.e. productivity depends on operator efficiency.

### III. OBJECTIVE

The main objective involves in Design and fabrication of pneumatically operated embossing machine with programmable controller. In this machine embossing operation is done on putty as a prototype. Project involves overcoming limitation in manual operation embossing machine.

### IV. PROBLEM DEFINITION

In manual operated embossing machine operator perform operations like loading workpiece to work holder, operating hand lever to perform embossing, checking whether emboss is performed perfectly, unloading of workpiece and counting of finished workpiece. Hence as work continuous hour by hour operator efficiency slows down i.e. productivity decreases since work is tedious. In fast replication process where mass production requires continuous operation, manual operated embossing machine is not suitable for this purpose hence innovation requires to enhance fast replication continuous mass production.

*Problem Associated With Manual Operated Embossing Machine*

- Operator dependence.

- Human efficiency reduces since work is tedious
- Time consuming due to more strain.
- High cost of labour for continuous mass production
- Low productivity
- For fast continuous replication process optimum productivity is not achieved

### V. SOLUTION TO THE PROBLEM

To overcome the problems in existing manual operated embossing machine, automation of the machine by using pneumatic system, PLC and sensors is proposed.

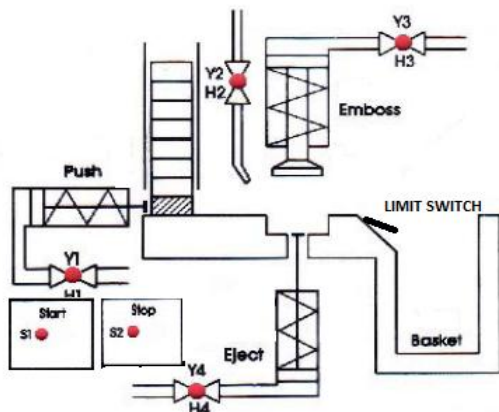
### VI. AUTOMATION

Automation is the technology by which a process is accomplished with minor human assistance. It is implemented using a program of instructions combined with a control system that executes the instruction. It reduces the need for human intervention in the scope of industrialization; automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, Automations greatly reduces the need for human sensory and mental requirements as well process and systems can also be automated. In this project, automation is achieved by using programmable logic controller.

### VII. PROGRAMMABLE LOGIC CONTROLLER

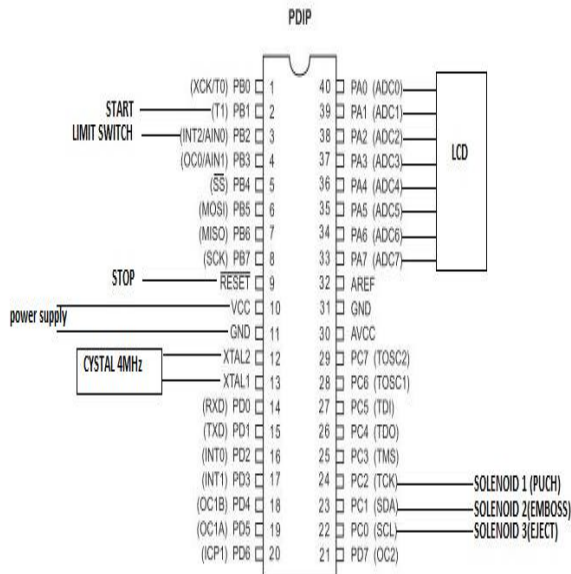
PLC is a solid state device. They are well-adapted to a range of automation tasks .All control operations are done using the PLC. The entire bottling process is automated by feeding the necessary conditions into the PLC using ladder logic. Ladder logic is one of the methods of programming a PLC. Thus, depending on the logic developed the filling of bottles is done. PLC consists of an I/O unit, central processing unit, and a memory unit. The input/output unit of the PLC acts as an interface to the real world. Inputs from real work are given to the input unit which is manipulated based on the programming, and the results are given back to the real world through the output unit of the PLC. All logic and control operations, data transfer and data manipulation operations are done by the central processing unit. The results and statuses are stored in the memory of the PLC. PLC's are used for a wide range of applications especially in the field of control and automation.

### VIII. PROPOSED WORK



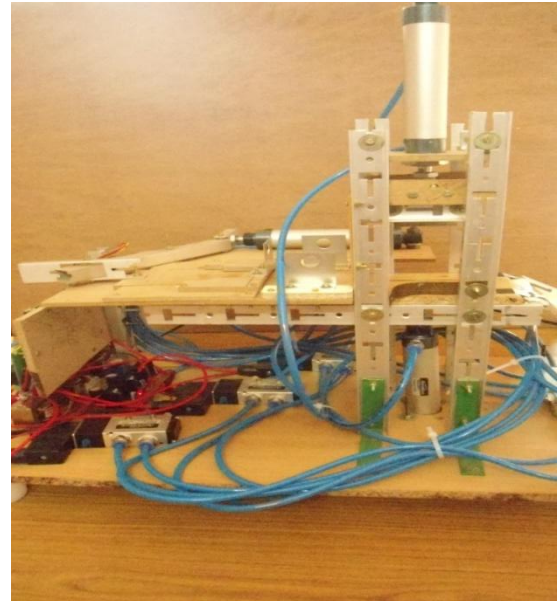
Workpieces are to be embossed by means of an embossing machine. After activation of the s1 pushbutton “start”, a workpiece from the magazine is to be pushed under the embossing tool by means of the push- cylinder. The piston with embossing tool of the emboss- cylinder moves onto the workpiece. As soon as the "emboss" cylinder with the embossing tool is retracted again, the "eject" cylinder lifts the workpiece push the workpiece off the work bench into the storage basket this seasoned by limit switch sensor then only next cycle starts.

### IX. PLC CIRCUIT CONNECTION



### X. DESIGN AND FABRICATIONS

There are several hardware elements which are used in design of a packing assembly. These are responsible for the motion of each part at each station. This is arranged orderly and fabricated to obtain final assembly.



### XI. RESULT

Desired embossing operation is performed on putty as show in figure.



Counting of finished workpiece is show on LCD display.



## XII. CONCLUSION

Low cost automated embossing machine is achieved. In this machine operation like loading and unloading of workpiece, embossing operation and counting of finished workpiece is performed automatically.

## XIII. REFERENCE

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