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AUTOMATION OF HEATING, BENDING, CUTTING OF GLASS TUBES USING PLC

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Abstract-In recent infrastructure development, it is found that glass structures are widely used. Development of glass structures needs more human efforts. In present scenario scarcity of labors is experienced. In order to tackle this issue, automated heating, bending cutting of glass tubes is proposed. Buildings, industries interior curves & different shapes is fully of glass structures. Giving different shapes to the glass is very difficult process as it involves two different temperatures for heating and cutting operations. As heating requires very large temperature where as for cutting operation temperature should minimum. Heated glass tubes are passed in a process line having particular length, which is to be bent. To manufacture fluorescent bulbs, these tubes are to be bent in U shape. Manually this operation is very difficult. In this paper for the automation of these operations is controlled using PLC. Important tools used for this operation metal support and cutter. Metal support is continuously heated so that glass tubes do not break while bending operation. For different structure needs different length, so by using proximity sensor different length can be provided. For particular length of glass tube, it can be heated and bended. Metal support is not exactly square but it has a curvy ends for smoother bending operation. The proposed work is simulated using PLC Indra works Engineering.

Keywords: PLC, glass tube, proximity sensor

I.Introduction

Glass tubes are mainly cylindrical hollow-wares, their special shape combined with a huge variety of glass types, allow using glass tube in many applications. Glass is a good electrical insulator and metal electrodes in a glass envelope can be raised to incandescence by eddy current induced by a coil, outside the envelope, carrying high frequency current. The basic techniques developed for scientific glass working involve the manipulation of glass in the form of tubing or rod using a flame as a source of heat. It is most typically used as transparent glassing material in the building envelop, including windows in external walls. Glass is also used for internal partitions and as architectural features. When used in buildings glass is ruler or measuring tape and putting a mark on it with an ink pen or glass marking pencil. Holding it with one hand near the point cutting can be performed. In manual process, continuously temperature needs monitored, for maximum temperature bending is performed and for minimum temperature cutting is done. In this process more pressure can't be applied on the tube otherwise glass tube may break. Overall this procedure needs more human efforts and includes complex operation. In order to overcome all these issues, an automated glass tube length has to be selected using proximity sensor. Automatically maximum and minimum temperature of glass tube should be maintained for bending and cutting operation. Often of a safety type includes reinforced toughened and laminated glasses. Different infrastructure requires different shapes in glass architecture. Giving different shapes to the glass is very difficult process by manual operation. It involves selection of glass tube, measuring the required length of glass tube by using a proposed architecture

Some of the related works are as follows.

In paper [1] author proposed how we can use or convert conventional cutting process with the help of PLC, Pneumatic Cylinder, sensors and dc motor into the process. It is a time saving with good quality procedure. In the paper the various Man Motion has been done with help of cylinders. Such kind of conversion can be done easily where high volume with good quality to be produced. The industrial **CNC** (computer numerical control) machine components are fabricated using quality material and technology. The system is superior in both performance and is more flexible in operation.

In paper [2] author presented a design of a system based on PLC that is used for profile cutting in industrial purpose. The PLC system has been designed to program with particular shape and size, then cutting machine runs according to programming of PLC and cuts the profile with perfection. When the PLC recognizes any increase or decrease in the level of voltage, current or temperature values the unit has been made shutdown in order to prevent it from further damages with the help of relays in the system.

In paper [3] author proposed by using fabrication of semi automatic glass cutting machine it is very accurate cutting in taper angles and also the straight line, square or rectangular cutting. This proposed work helped to learn more about Designing, machining process, material handling, material selection, process planning, cost estimation.

The main objectives of this paper are:to develop accurate cutting as compared to hand cutting, to develop fast cutting operation this will save time, to facilitate easy

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fault detection in system, to develop increase in production rate, to facilitate reducing a number of labor for inspection. Organization of the paper is as follows. Section 2 presents the proposed work. Simulation and results are discussed in section 3. Section 4 presents the conclusion of the paper.

II. Proposed Work

Figure-1 shows model for heating, bending and cutting operation of glass tubes. It includes mainly PLCLM10, proximity sensor, glass tubes, metals support and cutter. Metal support is a continuously heated so that glass tubes do not break while bending operation. For continuous heating operation it must required air supply.

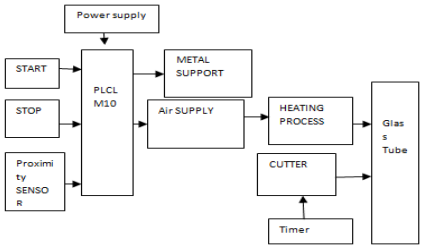


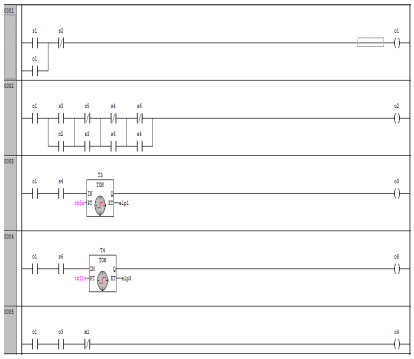
Figure1: Block diagram

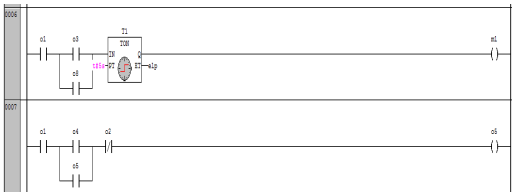
By using one proximity switch it monitors continuous air supply for heating operation. To start the overall operation, activate the start switch that automatically activates air supply for continuous heating operation. Different structure needs different length so by using proximity sensor different length can be provided. After that the length has to be selected particular length of glass tube, and then bending operation needs to be performed. After bending operation, air supply switch should be turned OFF, Which automatically stop the heating process and temperature of glass tube becomes minimum for cutting operation. Cutting operation for selected length of glass tube needs to be performed using cutter. By using timer it is possible to set required time for cutting operation. After completion of the cutting operation of one glass tube, program must be return back to switch ON the air supply for again continuous glass heating operation. Further all procedure remains same for all the pieces of glass tubes. The proposed work is simulated using plc Indra works Engineering

III. Simulation And Result

The PLC is an industrial computer. It is capable of storing instructions to implement control functions such as sequencing, timing, counting, arithmetic, data manipulation and communication. The I/O interfaces provide the connection between the PLC and the information providers (inputs like pushbuttons, sensors) and the controllable devices (outputs like valves, relays, lamps).There are different types of PLC like Indra Logic L10, L20, and L25 etc. Indra Logic L10 PLC has been used. PLC and the information providers (inputs like pushbuttons,sensors) and the controllable devices (outputs like valves, relays, lamps). The proposed ITCS system consist of PLC (LM-10) with RS232 serial communication, compact flash card, on board I/O (DI8 /DO8) and power supply, Sensors (IR). RS 232 is a standard for serial communication transmission of the data. The power supply of 24 V DC for CPU, Onboard I/Os, in line module.

A. Simulation And Result





Switch	System start or stop
S1	Switch 1(To start the process)
S3	Switch 3(To detect the glass tube)
S4	Switch 3(To select 5cm length of glass tube)
S6	Switch4(To select 10cm length of glass tube)
Timer3	Timer1(Timer for proximity sensor, time required to sense 5cm length of glass tube)
Timer4	Timer4(Timer for proximity sensor, time required to sense 10cm length of glass tube)
Timer1	Timer1(Time required for cutting operation)
O1	Output switch(for heating process)
O2	Output switch(air supply)
O3	Output switch(bending operation for 5cm length of glass tube)
O8	Output switch(bending operation for 5cm length of glass tube)
M1	Output switch(to indicate cutting operation of glass tube is over)
O5	Output switch(return operation for next glass tube)

Figure 2: Flow Chart For The Proposed Work

IV. Conclusion

In this paper automated glass tube cutting operation by using programmable logic controller is presented, which has better and got faster execution time and is more efficient in working along with safety. The proposed automated programmable logic controller system is designed to program with particular shape and size, then cutting machine execute according to programming of PLC and cuts the glass tube with perfect shape. For glass tube operation metal support is not exactly square but it has a curvy ends for smoother bending operation. Overall

this operation accurate cutting as compared to hand cutting, fast cutting operation this will save time, easy fault detection in operation, reduced number of labour for inspection.

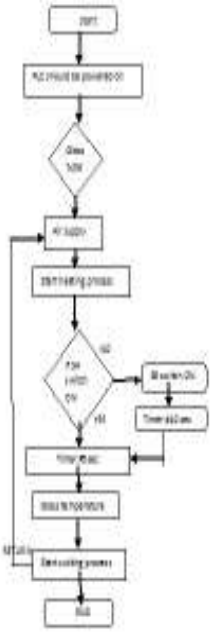


Figure 3: Flowchart

References

[1] Rushikesh Gadale, Mahendra Pisal, Sanchit Tayade, S.V. Kulkarni,2015, PLC based automatic cutting machine Shashi Sahu, satya Kumar Behera, Amar Kumar Dey,2015, A Review of Automated Profile Cutting machine using PLC

[2] Murali Krishnan. R, 2Sudhakar. C , 3S. V. Saravanan, 4L. Suresh, 5N. Maheshwari, fabrication of semi automatic glass cutting machine by using diamond tool

[3] Balashanmugam, G.Balasubramanian,2015, Design and Fabrication of Typical Pipe Cutting Machine