PLC BASED AUTOMATED PACKET FILLING MACHINE

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Abstract– *Today's Rapid development of modern mechanization and with the new automation packaging technology, the quantitative packaging of various items should be accurate and this leads to the direct impact on the survival and economic benefits. Mostly manufacturers have being opting for a highly automated production line. The Low Cost Automation which is popularly known as LCA, is simple pneumatic, hydraulic, mechanical and electrical devices put into the existing production machinery, so that their productivity can be improved. This would enable the operation of this equipment by semi-skilled and unskilled labor, with a little training. This uses the standardized parts and devices to mechanize and automate machines, processes and systems.*

*Key Words***: PLC, LCA, SMPS, RELAY CORDS, CP1E, HMI**

1. INTRODUCTION

Industry automation has now become the global trend in manufacturing. The process of packaging is one of the most uses in industry many companies are switching to automation. This project is mainly devoted to the use of automatic control system in process machine system, this control system will have a major role in controlling all parts of the project. In this project we have designed and developed a machine named Automated ice-cream packaging and Filling Machine. The main purpose of this project is to fill system where this system can automatically fill in liquid into their boxes by using PLC as a controller. Batch operation is used in which a set amount of inputs to be process are received in a group, and the operation produces the finish product. The project is divided into 3 sections; first the loading section, second is the conveyor section (transfer section), and third is the filling section. This three sections are controlled by the PLC. In this project all the work will be done by automation so it will decrease the man power usage. The process called Human held filling process puts improper volume of liquid into the bottle. With the use of automated system it will set the volume of the liquid exactly the same for each bottle. It would need more time and would cost more if all the process is done manually.. This machine will decrease the human error while doing this process manually.

1.1 Programmable Logic Controller

A Programmable logic controller (PLC) also known as, PLC or Programmable Controller a digital computer known for its automation processes electromechanical, such as machinery control on factory assembly lines, amusement rides, or light fixtures. These are used in many industrial machines. General-purpose computers, the PLC was designed for arrangement of multiple inputs and output , extension of temperature ranges, noise electrical immunity, and resistance to vibration and impact. There are programs that control machine operation which are typically stored in battery-backed-up or non-volatile memory.

2. LITERATURE SURVEY

Before introduction of electronics, computers, PLC's, most of the industrial processes relied on machine-tool type relays to control their machinery. The use of machine-tool relays became common place in the movable bridge industry. Motor starters and contactors were large and bulky at that time, and were requiring large operating coils in order to operate. Because of this, the relays that controlled the motor starters and contactors had to be fairly heavy-duty to handle these switching currents which are required to operate these devices. When the electrical control industry were developed, different varieties of control-type relays began to emerge.
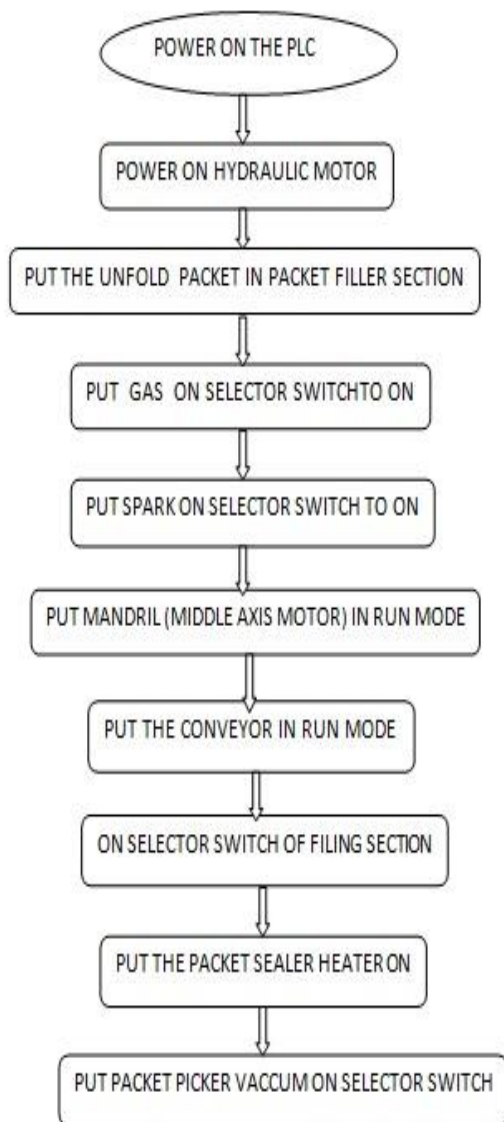
In 1992, Balemi proposed an interpretation of supervisory control theory from input and output perspective. This system was constructed as an input/output process where commands were accepted as inputs, and outputs produced some messages regarding changes that were occurred in the system. There would be a controller which was controlling the system in a similar way as described, accepting the outputs of the plant, and in turn producing commands. Both the controller and the system developed the "generating" process in the closed-loop systems. Balemi found some problems of communication delay between plant and the supervisor. Applying this scheme for a Rapid Thermal Multiprocessor (RTM) to control environment had been implemented at the Center for Integrated Systems at Stanford University.

Fabian and Hellgren in 1996, suggested that the main reason for this was of the discrepancy between the abstract supervisor and physical implementation. This is noticeable when the implementation was to be based on programmable logic controllers (PLCs). They came across some problems which were in physical implementation of supervisors. Again in 2006 they improved their structure and came with a Flow Chart named Sequential based algorithm for developing the PLC code. In 2009 Max and Silva developed a scheme using the methods and used automatic code generator for the PLC code part. This was perfect step in automation of the controller implementation process and PLC came into existence.

3. WORKING METHODOLOGY

PLC is responsible for all the operations in our project. the power is switched on of PLC due to which the hydraulic motor is switched on which is responsible for creating pressure so that the boxes are properly shaped by other mechanical parts which are moved by the pressure that is created. The unfolded packet is put in the filling machine. a proper shape is given to the box i.e a rectangular box. The Gas Selector switch is on so that one end of the box is properly sealed with the gas generated. the boxes are now sent on the conveyer belt. The Selector switches are on and total 3 packets are sent at conveyer belt at the same time where the limit switches are responsible for placing the packets that are exactly below the valve. The conveyer is switched on the conveyer belt and is put on the run mode. The valves are switched on by which the packets are filled with ice-cream. After filling the packets they are sealed by switching on the heater. All the processes are controlled by PLC.

Flowchart -1: Working mechanism

FILLING OPERATION: If Once the bottles are detected at the input side the conveyor motor switches gets ON and gets started to move in the forward direction. Bottles then reach the desired position for filling and stops the conveyor. The pumps which are in process tank switch ON and filling operation takes place.
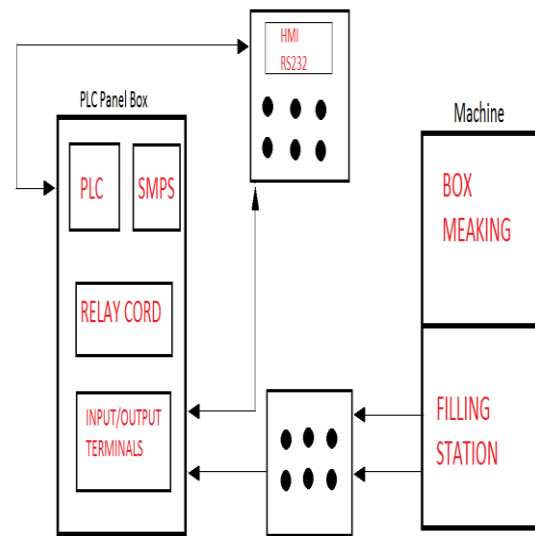
3.1 BLOCK DIAGRAM

Fig -1: Block Diagram

3.1.1 Block Diagram Description

PLC Panel Box consist of :-

SMPS:

The Switched Mode Power Supply owes its name to the dc-to-dc switching converter which is used for converting from unregulated dc input voltage to regulated dc output voltage. A switched-mode power supply also known as switching-mode power supply, switch-mode power supply, SMPS, or switcher which acts as an electronic power supply that incorporates switching regulator to convert electrical power efficiently.

RELAY CORDS:

A relay is an switch which operates electrically. Many relays makes use of electromagnet to operate a switch mechanically, but operating principles are also used, such as solid-state relays. These are used only if it is

necessary to circuit control which has a low-power signal with Electrical isolation between control and controlled circuits, and several circuits must be controlled by just the one signal.

CP1E:

This CP1E series shares with the same architecture as all Omron's PLCs -but with smaller yet powerful instruction set- programs that are compatible across platforms and allow for easy upward migration.

HMI:

The Industrial Omron PLC HMI Display Touch Screen Panel RS232 / RS485

- It has 3.7 inch LCD,
- It contains power supply of DC24V,
- OP series PLC HMI (human machine interface),
- It has 20 function buttons,
- Can communicate with most brand of PLC models.

4. CONCLUSIONS

To increase the productivity we have made use of the automation system, which in turn brings economic progress. The main purpose of these PLC in automation is to control the whole system. The installation cost is not cheap but it can efficiently run for a long period of time. Performance, flexibility and reliability is mainly based on the investment. The PLC based control system will be applied to the automatic ice-cream filling station previously specified. Because of this the entire system will be more reliable, time saving and user friendly.

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