

AUTOMATIC INJECTION MOULDING BY USING PLC'S

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ABSTRACT

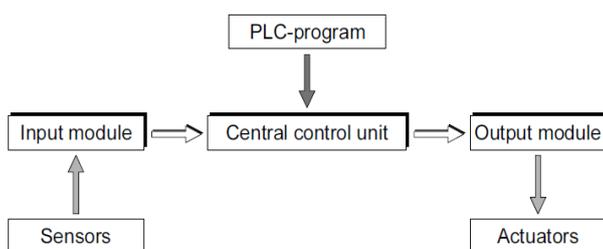
The implementation of "Low cost Automation" technique will achieve excellent quality along with high rates of production which is very important for survival of a manufacturing unit.

This paper mainly discussed about the automated process of feeding and dispatching the components to the heat chamber. Asbestos materials are used in wide range in some countries with its high insulating properties and fire and corrosion proof. But it is somewhat health hazardous to use it in high range. As the material is used along with fibres, it must treat with high temperatures to improve its qualities and increase the hardness of the materials.

Keywords— switches, relay, sensors, actuators, Asbestos material

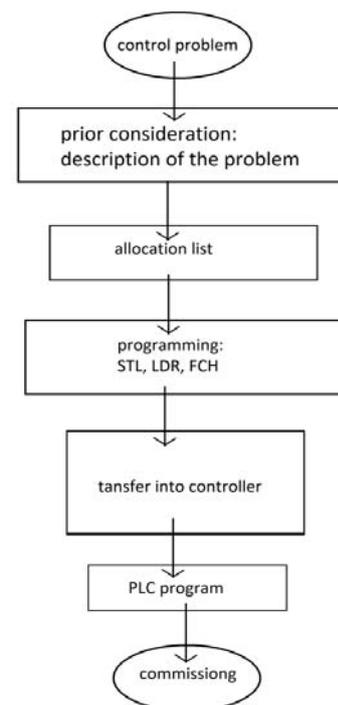
1. INTRODUCTION TO PLC'S

A programmable logic controller is therefore nothing more than a computer, designed specifically for certain control tasks. The function of an input module is to convert incoming signals into signals, which can be processed by the PLC, and to pass these to the central control unit. The reverse task is performed by an output module. This converts the PLC signal into signals suitable for the actuators. The actual processing of the signals is effected in the central control unit in accordance with the program stored in the memory.



The PLC programming mainly consists of a programming panel- to write the program, PLC rack- compound of Processor, memory, IO slots, supply battery and I/O boxes to give connections.

The PLC programming mainly designed on the prescribed manner. The programming has different steps. The sequence of designing a program is as follows:



1.1 How to write a PLC program?

In writing a PLC program the following steps to be followed according to the syntax.

Step 1: Understanding the problem.

The given problem is to be studied well twice or thrice to get a clear idea about the logic in it. After getting the idea about logic, the programmer will get a clear view about the number of input and number of outputs required in the logic.

At this step the programmer will decide the sequence of the problem and thus the characteristics of the circuit will be detected either operable or inoperable.

Step 2: Memory allocations.

This is one of the main tasks in program writing because the connection of the circuit will do according to the allocations not with logics. In every PLC processor the in-built I/O racks are connected. The inputs and outputs of the logic are connected as per the allocation list. Every I/O box contains 8 inputs (0-7) and 8 outputs (0-7). If any wrong connection is given in the allocation list, the entire system will get locked. Care should be taken while allocating the memories and connecting the connections.

Step 3: Programming.

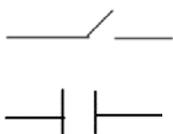
In PLC, programming may write in anyone of three ways. They are:

- STL- Statement Logics,
- LDR- Ladders,
- FCH- Flow Charts.

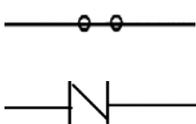
The method in which we are writing the program is to be choosing first. The Statement method is nothing but writing a statement as per the logic. The basic input output connections must be familiar to program writing. In the case of Ladder diagram, the electro-pneumatic ladder diagram must be taken to develop the same logic in PLCs. The signals from the trip valves or sensors are representing with the allocated memories to generate outputs as per the allocation list only.

The program should be written in the blocks like Organizational block, program block, functioning block, etc. The execution of the program always starts from the Organizational block we indicate it in the program as OB. We can command the execution to jump to any block of the program by using the block name. JU command is used to transfer the execution with or without any condition. For every block written in the program must be ended by using the command; BE. The PLC symbols are also closely related to electro-pneumatic symbols they are like:

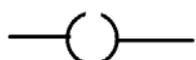
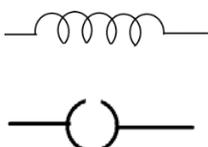
Normally open switch:



Normally closed switch:



Output (solenoid):



Step 4: connection as per allocations.

The connections to the components as per the allocation list should be given. The connections are given only as per the allocation list and irrespective of the logic written in the program.

Step 5: Transferring the program.

The program written in the panel is to be transferred to the PLC rack. The program logic is given to the PLC memory and the execution starts in it. The processor in the PLC rack is receiving the logic. The inputs and outputs are taken into the processor and the logics are executed sequentially.

1.2 Simple program structure:

Step 1:

To develop a PLC program for continuous A+A- circuit we need three inputs and two outputs.

Inputs: switch, TA- and TA+.

Outputs: A+ and A-.

Step 2:

Let us allocate the memory to the inputs and outputs according to the standards of STEP 5 version.

INPUTS:	switch	-	I 32.0
	TA-	-	I 32.1
	TA+	-	I 32.2
OUTPUTS:	A+	-	Q 32.0
	A-	-	Q 32.1

Step 3:

Method 1: Statement logics

A TA-

= A+;

A TA+

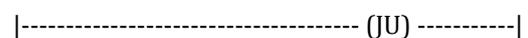
= A-;

; BE

Method 2: Ladder

OB1:

PB1



PB1:

I 32.0 I 32.1
Q 32.0

|-----| |-----| |------()-----|

I 32.2
Q 32.1

|-----| |------()-----|

; BE

Step 4:

The connections to the panel are given as per the memory allocations in the memory list.

Step 5:

Transfer the written program to the PLC box to run executes the statements.

2. INTRODUCTION TO INJECTION MOULDING

INJECTION moulding is now a well-established fabrication process in environmental industry. It has more advantages in the most situations over the older processes of compression and transfer moulding. These advantages comprise reduced labor cost, better dimensional control and shorter cure times for injection moulding process. This process is still improved and other materials (not only thermoplastic) are used for

Example elastomeric compound.

The injection moulding process is a cyclical process, each cycle comprises several operations: feeding, melting and homogenization of polymer grains inside the plasticizing cylinder mould closing, injection under pressure of melt in mould's cavities and cooling or heating of polymer inside the mould, mould opening and ejection of moulded piece.

In fig.1 there is shown time influence for each parts of cycle. It is necessary to realize, that rubber injection moulding cycle is several times longer than for thermoplastics.

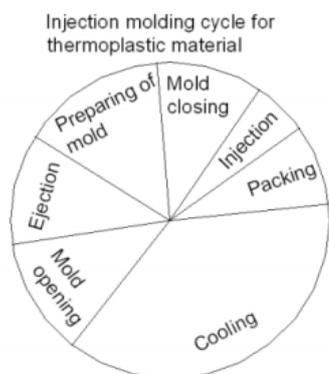


Fig.1 Thermoplastic injection molding cycle

3. DETERMINATION OF CAPACITIES

The number of cavities in injection mould is determined in most of the cases by machine performance but same

times by moulding shapes.

Ns → Number of cavities based on shot capacity

W → Rated shot capacity for particular polymer (f)

M → moulding weight per cavity (g)

Np → Number of cavities based on plasticity capacity

P → Rated plasticizing capacity for particular polymer

Nc → Number of cavities based on clamping capacity

C → Rated clamping capacity in tones

Pc → Rated clamping capacity in tones

A_m → Projected area of moulding (sq.cm)

Determine by the shot capacity (based on 85% of rated shot capacity)

$$N_s = \frac{0.85 W}{M}$$

Determine by plasticizing capacity (based on 85% of plasticizing capacity)

$$N_p = \frac{0.85 P}{M}$$

Determine by clamping capacity

$$N_c = \frac{C}{P_c \times A}$$

4. INJECTION MOULDING CYCLE

The following the injection moulding cycle includes the

1. The nozzle of the cylinder is preset against mould in constructing the mould the highest pressure of the nozzle against the sprue bushing as to be taken into account.

The mould cavities are filled after the injection pressure reaches the maximum value just when the mould is necessary filled.

For thin walled products the injection speed is more important than the injection pressure due to the high injection speed high pressure will occur any ways during filling it is of great importance that the air in the mould can be easily evacuated from the cavities during filling.

The machine switches over to after pressure and the molten material solidifies in the mould.

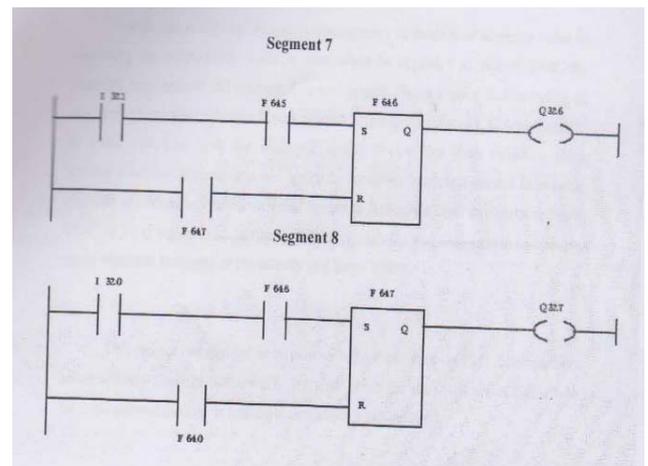
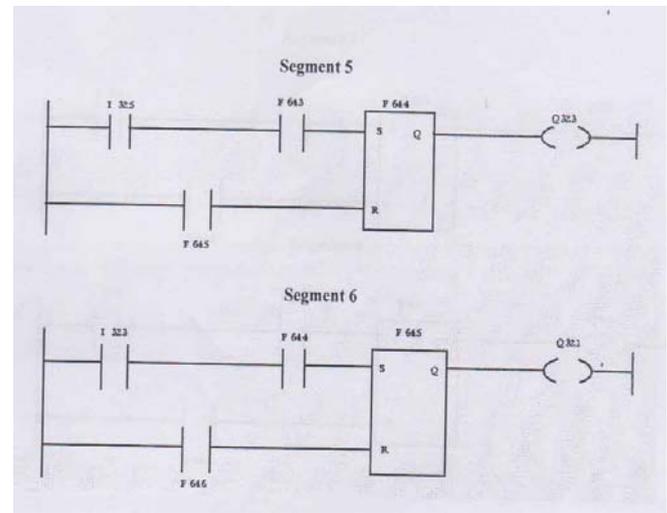
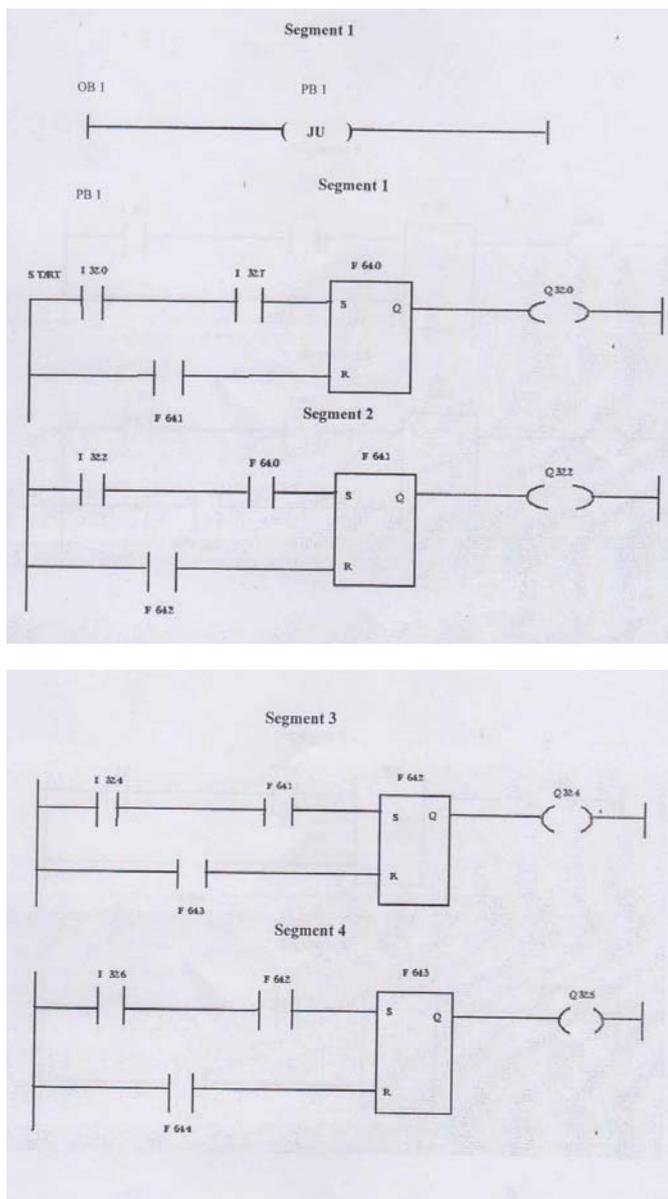
After pressure is necessary to compensate the difference in volume of the molten material and the solid material and to prevent the formation of sink marks during solidification.

5. SEQUENCE

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

Inputs	Outputs
PB I 32.0	A+ Q 32.0
TA- I 32.1	A- Q 32.1
TA+ I 32.2	B+ Q 32.2
TB- I 32.3	B- Q 32.3
TB+ I 32.4	C+ Q 32.4
TC- I 32.5	C- Q 32.5
TC+ I 32.6	D+ Q 32.6
TD- I 32.7	D- Q 32.7
TD+ I 33.0	

Ladder diagram Representation



5. CONCLUSION

The implementation of “Low cost Automation” technique will achieve excellent quality along with high rates of production which is very important for survival of a manufacturing unit.

Nevertheless is the use of modern management methods is of immense value in improving the productivity while it must never be regarded as end of itself, the scientific management and tools must be encouraged. Hence a good understanding of low cost automation technique is very essential. The application of L.C.A particularly in small industries with the usage of simple device like limit switches, relay, sensors, actuators of pneumatic and hydraulic including electrical control to existing ordinary machines and labour - oriented operation will make them automatic at “Low Cost” to yield higher productivity, profitability, stability and also growth in building up of National Economy of the country to a larger extent. This paper has enabled us to gain on hand experience on PLC.

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