

# CONTROL OF CONVEYOR USING PLC

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**Abstract**— A programmable logic controller (PLC) is a digital computer used for automation of electromechanical processes, which is a type of computer family and they have commercial and industrial applications. The development of programmable logic controller (PLC) makes it possible to do the required changes to the program without changing the electrical circuit connections. The Siemens s7-300 series programmable logic controller is used to mechanize the system. This paper presents an automation of conveyor belt logic using a programmable logic controller. For this system s7-300 PLC (CPU 313c) used and software for programming used is sematic manager.

**Index Terms**— PLC, conveyor motor, s7-300, function block, functional block diagram.

## I. INTRODUCTION

The PLC has its origin in the motor manufacturing industries. Manufacturing processes were partially automated by the use of rigid control circuits, electrical, hydraulic, and pneumatic. It was found that whenever change had made, the system had to be rewired or reconfigured. The use of wiring of boards on which could connections could be changed by unplugging them and changing them around followed. With the development of microcomputers it was realized that if the computer could switch things on or off and respond to a pattern of inputs, then the changes could be made by simply reprogramming the computer and so the PLC was born. PLC is an industrial computer control system that continuously monitors the state of input devices and makes decisions based upon a custom program to control the state of output devices. Almost any production line, machine function, or process can be greatly enhanced using this type of control system. However, the biggest benefit in using a PLC is the ability to change and replicate the operation or process while collecting and communicating vital information. Another advantage of a PLC system is that it is modular. That is, you can mix and match the types of

Input and Output devices to best suit your application. The PLC hardware is digital electronic devices with memory can be programmed to store commands or Information and the implementation of various operations such as logical operations, arithmetic and timing. There are several companies (PLC's) devices such as Siemens who produced SIMATIC 200, SIMATIC 300, and SIMATIC 400. Allen Bradley Inc., Mitsubishi and many others. Each company has its own software, but all accomplish the required job of the (PLC's).

## II. BLOCK DIAGRAM OF PLC.

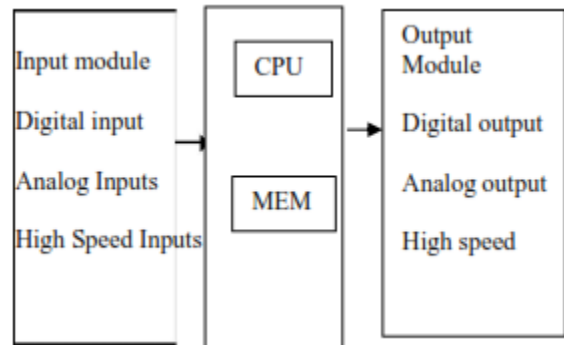


Fig.1

## III. HOW DOES A PLC OPERATE?

There are four basic steps in the operation of all PLCs; Input Scan, Program Scan, Output Scan, and Housekeeping. These steps continually take place in a repeating loop.

Four Steps In The PLC Operations :

- 1.) Input Scan Detects the state of all input devices that are connected to the PLC
- 2.) Program Scan executes the user created program logic

3.) Output Scan Energizes or de-energize all output devices that are connected to the PLC.

4.) Housekeeping this step includes communications with programming terminals, internal diagnostics, etc.

Styles

**Unitary**–The unitary PLC contains every feature of a basic system in one box. They are attached to machine being controlled.

**Modular**-These use range of modules that slot together to build up system. The basic modules are power supply ,cpu, input and output module. Other modules can be added such as ADC,

DAC.The main advantage is no of input and outputs can be expanded.

**Rack mounting**-This is similar concept to modular design but modules are on standard card that slot into a standard rack inside a cabinet. These are flexible and allow expansion of system.

#### IV. ADVANTAGES OF PLC OVER RELAY LOGIC

- 1- Flexible control, change any industrial process by modifying the program.
- 2- Maintenance and the discovery of faults in the PLC system are easily seen on the PLC screen.
- 3- Small size.
- 4-Has characteristics that are not available in normal computer.
- 5-Ability to engage with other PLC devices or other computers.
6. Instant monitoring system.
7. Low cost.
8. Durability, it is designed to withstand moisture, vibration and noise.
9. PLCs can be used in commercial and residential to solve the complex switching requirements.

#### V.OMRAN MICRO PLC

When it comes to controllers for compact machines, our CP1L series offers the compactness of a micro-PLC with the capabilities of a modular PLC. It provides all the functionality you need to control your machine, including outstanding positioning capability. On top of this some CP1L models have an embedded Ethernet port with socket services functionality to give you flexible connectivity for monitoring, operating, logging and remote access. The CP1L is completed with a range of optional boards for serial communication or analogue I/O and further expansion units in case more I/O is needed. As the CP1L series shares the same architecture as the CP1H, CJ1, and CS1 series, programs are compatible for memory allocations and instructions..



Fig.2OMRAN MICRO PLC

#### VI. FLOW CHART

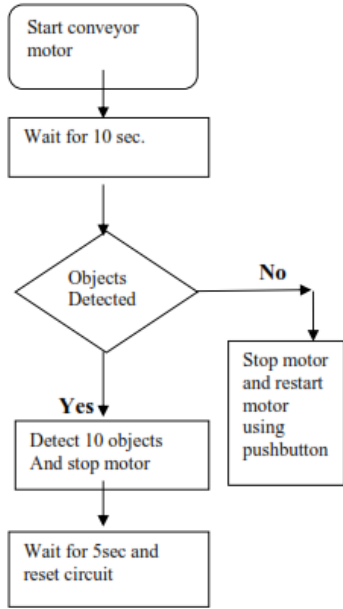


Fig.3

VI. PROGRAM IN OMRAN MICRO PLC

Here to make program faster and save memoryfunction block used. Following pictures shows

program to control conveyor motor in functionblock. Here programming language used is functional block diagram.

Legend for Detail Conveyor Control Using PLC :

1. Conveyor Belt
2. Infrared Sensor
3. Push Button Start (Normally Open Contact)
4. Push Button Stop (Normally Closed Contact)
5. Potentiometer Speed Controller
- 6.Empty Light box
7. PLC (Programmable Logic Controller)
8. Inverter for Speed Control of Motor
- 9.Electric Motor
10. Belt and Pulley Systems

B. PLC Input and Output Devices :

1.PLC Input :

- i) 1 Input Unit for Infrared Sensor
- ii) 1 Input Unit for Push Button Start
- iii) 1 Input Unit for Push Button Stop
- iv) Total PLC Input, minimum of 3 Input.

2.PLC Output :

- i) 1 Output Unit for Empty Light box
- ii) 1 Output Unit for Start-Stop on Inverter
- iii) Total PLC output, minimum of 2 Output.

C. Sequence of PLC Programming for Conveyor Control

1. Conveyor Start

a. If Push Button Start = ON Then Output Unit for Start-Stop on Inverter = ON (Hold ON)

2. Conveyor Stop

- a. If Push Button Stop = OFF Then Output Unit for Start-Stop on Inverter = OFF
- b. If Infrared Sensor = ON Then Output Unit for Start-Stop on Inverter = OFF Else Output Unit for Start-Stop on Inverter = ON

3. Empty Light box = ON

a. If Output Unit for Start-Stop on Inverter = ON AND Infrared Sensor = OFF AND Wait For 10 Seconds Then Empty Light box = ON Else Empty Light box = OFF

D. Conveyor Control Using Omron PLC

PLC Type CP1L, Name Input / Output PLC :

INPUT PLC :

- I: 0.00 ; Infrared Sensor
- I: 0.01 ; Push Button Start (Normally Open Contact)
- I: 0.02 ; Push Button Stop (Normally Closed Contact)

OUTPUT PLC :

- Q: 100.00 ; Empty Lightbox
- Q: 100.01 ; Start-Stop on Inverter

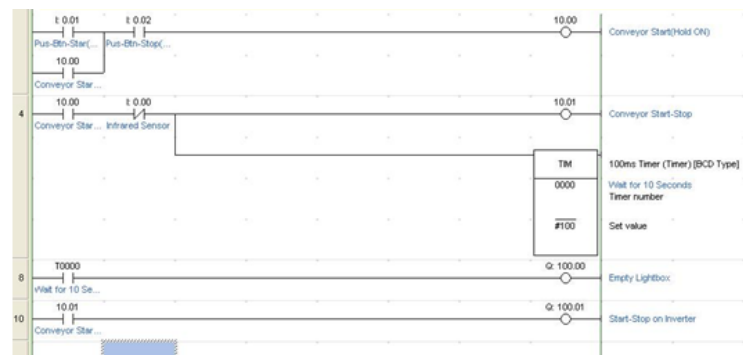


Fig.4. Software program

## VII. CONCLUSION

PLC today are advancing in terms of applicability and capability. The System works during normal operation and greatly improved the automation processes with the use of the PLC ladder diagram. The wiring and installation procedure are also improved because the PLC input and output devices are assigned with specific addresses, and thus; further amplifies troubleshooting. Cost reduction mainly on the man-power or personnel cost is achieved in this paper. Hence, only one or two personnel are needed for the operation and maintenance with the automated system. After a thorough investigation, the researchers highly recommends extending the other automation processes such as adding input, adding output devices, and also the expansion of the ladder program. The utilization also of the other PLC brands and models may be suggested depending on the need and specifications of different processes. Belt conveyor in STEEL Plant will be controlled using Programmable Logic Controller, sensors and Rotating mechanism, etc. In the point of view of reducing human efforts, PLCs are important part to design with more reliable and less power consumption for conveyor control operations. This proposal gives better accuracy, reliable operation in Real-time. This proposal is to segregate the products on the conveyor effectively.

## REFERENCES

- [1] Santosh B Belekar, Abhijit Desai, Meghraj Parit, "PLC And SCADA based monitoring and control" Multidisciplinary Journal of Research in Engineering and Technology Volume 1, Issue 1 (April 2014) Pg. 105-110.
- [2] K. Gowri Shankar "control of boiler operation using PLC SCADA Proceedings of the International MultiConference of Engineers and Computer Scientists 2008 Vol II IMECS 2008, 19-21 March, 2008, Hong Kong.
- [3] Joanna Marie M. Baroro, Melchizedek Alipio, Michael Lawrence T. Huang, Teodoro M. Ricamara, Angelo A. Beltran Jr. "Automation of Packaging and

Material Handling Using PLC". International Journal of Scientific Engineering and Technology (ISSN:2277 – 1581) Volume No. 3, Issue No. 6, pp: 767 – 770. 1 June 2014.

[4] Ahmad Fouad Alwan Project Design and Management of Programmable Logic Controllers for Electrical Technology Int. J. Emerg. Sci., 2(3), 322-333, September 2012 ISSN: 2222-4254 © IJES.

[5] [www.wikipedia.com](http://www.wikipedia.com)

[6] S7-300 manual.