



Solution for the Automatic Bottle Filling using PLC

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ABSTRACT

The goal of this sheet is to give concept of construction, working and component of Automatic bottle filling plant which is fully based on automation. Automation is used to trim the human efforts. The "BISLERI" water bottle filling by automation is one of the best applications of this concept. The bottle filling task is controlled by PLC controller which is heart of the whole system. Allen Bradley PLC is used for this system. The programming is done by the means of LADDER Programming language. To complete this task the component include apart of PLC are conveyer belt, DC motor, sensors, switches, SCADA (to control & monitor the function of the system. Through this task/system we reduce the Labour requirement and strengthen the profitability.

Key words: Mechatronics, Ladder logic, PLC, solenoid valve, Water level indicator

INTRODUCTION

The bottle is filled by industrial automation through SCADA & PLC. The sensors and actuators are included to get different output simultaneously. Proximity sensor is used for position of the bottle, IR sensor is used to know about size of bottle. The amount of water is calculated by limit switches. The PLC name is "PROGRAMMABLE LOGICAL CONTROLLER" to control the automation part. Ladder logical programming is the programming language which is mostly used in PLC's.

SCADA (sequential control & data acquisition) used to troubleshooting and control the industry. Software used for Allen Bradely PLC's is panel builder. This is an advance system gives high efficiency and flexibility of system. Program can be modified according to required result. It also increases productivity and profit.

PLC BASICS

A Programmable Logic Controller (PLC) is a kind of computer generally utilized in commercial and industrial control applications. PLC's differ from office computers by the tasks that they perform and so, therefore, the hardware and software they use to perform these tasks. As the applications vary extensively, all PLC's monitor inputs and other variable values and take decisions supported on a stored program, and control outputs to automate a process or machine. The fundamental components of a PLC are input modules or points, a Central Processing Unit (CPU), output modules or points, and a programming device. The type of input modules or points employed by a PLC depends upon the type of input devices used. Some input modules or points answer to digital inputs, also known as discrete inputs, which are either on or off. Other modules or inputs respond to analog signals.

The first function of a PLC's input circuit is to change the signals send by these various sensors and switches into logic signals which are employed by the CPU which assess the status of input, output, and other variables [1].

STAGE EXPLANATION

Here we are explaining the various stages of components used in our model of automated water filling system by a figure 1, which shows design of AUTOMATIC BOTTLE FILLING MACHINE in plant.

It consists of

1. IR SENSOR

2. TIMER
3. INPUT MODULE
4. SIGNAL CONDITIONING CKT
5. PLC
6. SCADA
7. SOLENOID VALVE
8. OUTPUT MODULE
9. PUMP
10. ACTUATOR
11. MOTOR AND LED

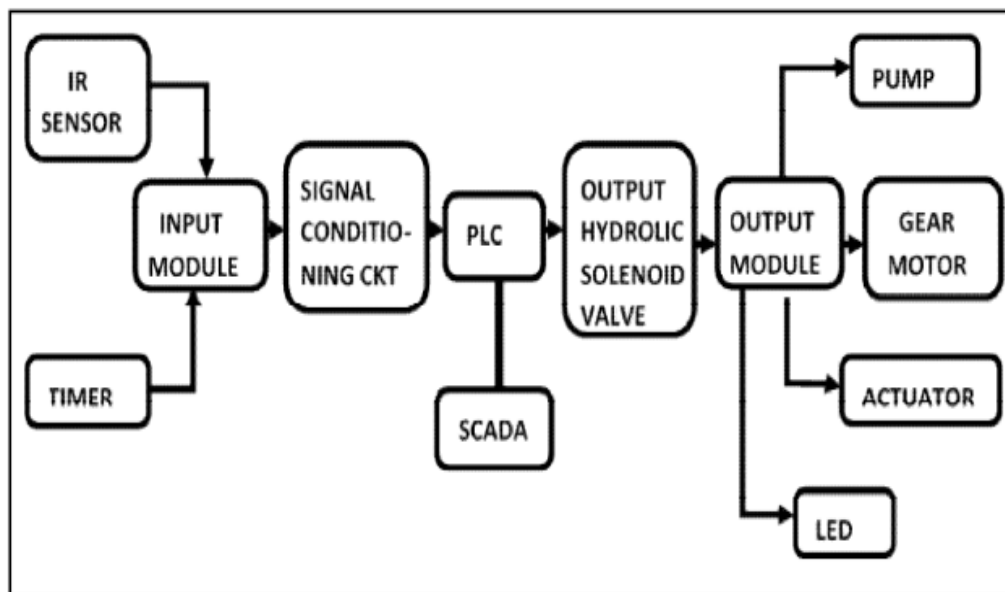


Fig. 1 Design of Automatic Bottle Packaging Machine in Plant [2]

1. **Input Module:** It includes different types of sensors like IR sensor (Bottle Presence Detection), Level Sensor (Amount of Water Detected).
2. **Signal Conditioning:** It amplifies the output of the system.
3. **PLC & SCADA:** Whole system monitored by SCADA. Automated PLC gets input by sensor and gives output at valves.
4. **Solenoid Valve:** The Valves open to fill the bottle, after the bottle filling take place it closes automatically.
5. **Module at Output:** Pump, actuator, motor, LED and these valves received the signal by PLC.
6. **Conveyor Belt:** The bottle strip move by convey or which is a long loop rubber [3].

PROCEDURE EXPLANATION

At starting, we select the auto start push button results the moter start and conveyor belt start moving. The shafts are DC gear type motor and shaft of roler are coupled to achieve high torque at constant speed. Then the number of bottle placed on the moving conveyor belt. When the bottle approaches near the photo-electric sensor then the bottle is sensed by photo-electric sensor and conveyor belt stops. The energized solenoid valve start bottle filling for a fixed time then solenoid valve de-energized again and water filling stops.

Then this filling cycle works continuously.

Tank water level decrease with the time then the water floats switch which is dipped inside the tank and indicate the low water level then it is closes the circuit with relay which is pumps the water to the tank and after tank is fully fills of water it turns off automatically

CONCLUSION

We made a PLC controlled automatic bottle filling system. PLC based automated liquid filling and control system is a part of industrial production system. . The automated liquid filling process is operated in such a way that it saves both time and cost. It makes the plant more efficient

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