AUTOMATIC BOTTEL FILLING, MIXING, AND CAPPING SYSTEM USING PLC

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Abstract:-
In these day's speedy-transferring, competitive commercial industries, an organization should be flexible, cost effective for its survival. Inside the manufacturing industries there is splendid demand for business automation systems.The economic automation is necessary in an effort to streamline operations in terms of acceleration, reliability and machine output. Intoday's cost-efficient world, automation plays gradually important position. This paper contains the information of automatic bottle filling and capping plant.In our paper the process is controlled using programmable logic controller (PLC) [1]. This paper proposes a filling and capping management machine for industries that is complete application of automation. It's controlling and tracking makes the machine without difficulty reachable and alert the operator in the case of any fault. It is one of the essential packages of automation in the cold drinks, pharmaceutical, chemical &medical industries, wherein a particular amount of liquid needs to be fill constantly into the bottles. The primary purpose of the paper is to plan; increase and take a look at the real time implementation of plc systems for ratio manipulate based liquid bottle filling and capping system.

Keywords:- PLC, arduino, solenoid valve, Automation, proximity sensor,

Introduction:-

Need of automation is increasing day by day,to reduce the human interference and cost in industry is the only solution. Task is to coordinate with different process & control every process with higher reliability. PLC is one of the options accepted by many industries. We are also using plc for controlling mechanism according to need of industry. We have used ladder logic to accomplish.

One of the growing industriesis beverage & medical industries. This project is focused on automation of these industries. For automation we have used PLC as central unit which communicate with different flow sensors actuator solenoid valve, motor, proximaty sensor capacitive sensor etc. we now automated bottle filling capping and packaging process.Many methods can be implemented to do these tasks. All methods are distinct from each other & have their own advantages and disadvantages. mallardhy ct al used timer system to accomplish the filling process where timer is used to ON and OFF the solenoid valve. We adopt the sensor method to do so. Many industries are requires filling of different liquids in proportion. We have used defined proportion for filling of two liquids using flow sensors which are controls by aurdino uno boardand Solenoid valve co-ordinated. Flow sensor is used to fill bottle. All other process of capping and packaging is done by use of motors conveyor belts and actuatorsof production,companies should adopt the new technologies. The market demands for higher production rate and make process more efficient and reliable cost wise and time wise as well. Automatic simulation process

Model design:-

It includes three main sections in design that are filling, capping, and rotary mechanism. Rotary mechanism is consisting of rotor disc of plywood with three slots for bottles. This rotor disc is rotated by using dc motor at 5 volt, 10 rpm. Filling section of design contains two fluid tanks and pvc pipes which carries fluid to bottle. Tanks are filled with two different liquids which are to be mixed in proportion. Solenoid valves are attached between pipesto fill the fluid. Two flowmeters are used to measure flow and arduino is used to calculate volumes of fluids. Capping includes small mechanism which enables cap to fall on the filled bottles and two dc motors.one is use to give vertical displacement and other to fit cap over bottle.

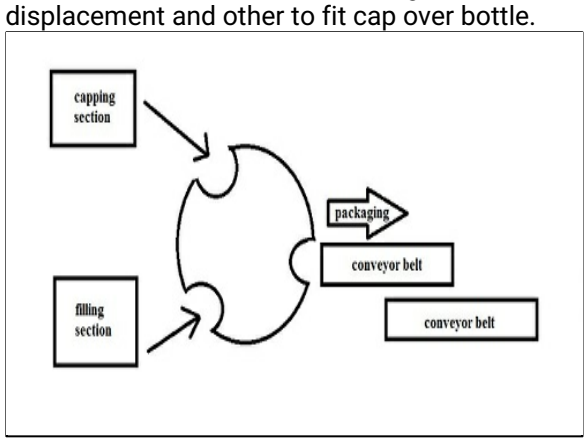


Figure 1: Design model

Working:-

This process is controlled by using programmed PLC. This system uses start/stop

push buttons to control the system. When we on the switch and if bottle is sensed by sensor then motor of rotary disc starts. This motor will move bottle to filling section. When bottle goes under tank sensor sense the bottle and valves open for two different time intervals so that both fluids filled at different proportions in the bottle. The filling volume of both fluids depends on user. This filling process is completely controlled by arduino. After finishing filling, again motor rotates the disc and moves bottle to capping section. While moving towards capping section particular mechanical arrangement helps cap to fall on filled bottle. When bottle is sense by sensor motor over the cap starts which rotates the cap over the bottle to fix the cap. Filling and capping processes are done simultaneously for further cycles at respective slots.

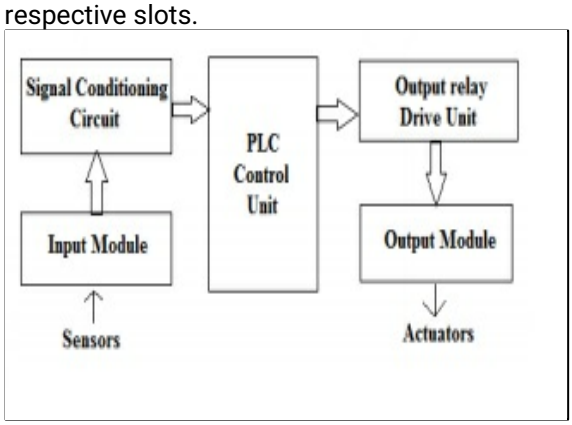
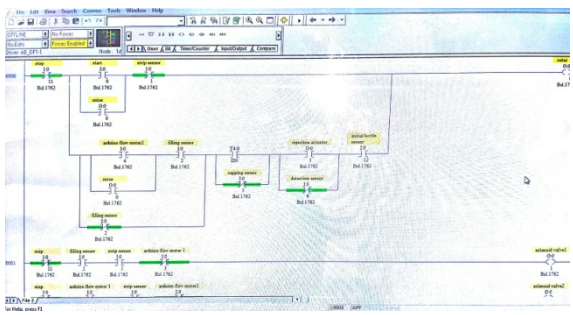
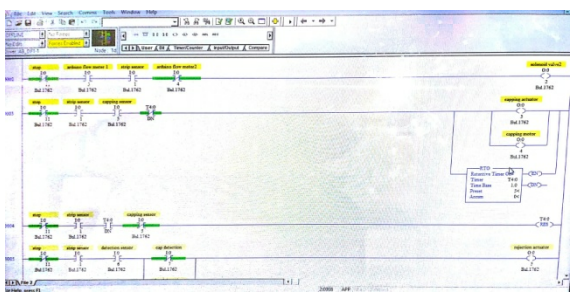


Figure 2: Block diagram of PLC

Basic Ladder Logic:-





3. COMPONENTS

PLC:-

A Programmable Logic Controller (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.

ARDUINO BOARD:-

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a buttonand turn it into an output - activating a motor, turning on an LED, publishing something online.

PROXIMITY SENSORS:-

Photoelectric Sensors detect objects, changes in surface conditions, and other items through a variety of optical properties.A Photoelectric Sensor consists primarily of an Emitter for emitting light and a Receiver for receiving light. When emitted light is interrupted or reflected by the sensing object, it changes the amount of light that arrives at the Receiver. The Receiver detects this change and converts it to an electrical output. The light source for the majority of Photoelectric Sensors is infrared or visible light (generally red, or green/blue for identifying colours).

DC MOTOR:-

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.

Relay:-

Relays are simple switches operated both electrically and mechanically. Relays consist of an electromagnet and set of contacts. There are also other operating principles for its working which differ according to their applications, relays used on the project as interface between the PLC outputs and DC motors inputs.

Flow sensor:-

A flow meter is an instrument used to measure linear, nonlinear flow rate of a liquid or a gas.

Solenoid valve:-

It is an electrically controlled valve used generally for shut off, release, dose, distribute or mix fluids. Combined with arduino we have used solenoid valve to control flow of fluids.

Result and conclusion:-

This paper is based on application of industrial automation. Automation system is used to increase productivity which in turn brings economic progress. This concept can be used in various industries like food, milk, chemical and mineral water. Using ladder diagram we are implementing bottle filling in different proportion and capping process.

More features can be added to this existing systemwhich can be implemented in future. Features like fast filling of liquid with the help of jet nozzle, simultaneously fill more number of bottles and providing safety and easy handling to the person which will improve production time. Labelling can be used as future work .Using SCADA system can be made more users friendly and reliable.

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