



## Liquid filling system for various sized Bottles

Manojprasaath.C<sub>1</sub>,Jayasuriya.J<sub>2</sub>,Sapthagiri.A<sub>3</sub>,Tamilmani.S<sub>4</sub>, Rajendiran.M<sub>5</sub>

*<sup>1</sup>B.E/EEE Final year, Knowledge Institute of Technology, Tamilnadu, India*

*<sup>2</sup>B.E/EEE Final year, Knowledge Institute of Technology, Tamilnadu, India*

*<sup>3</sup>B.E/EEE Final year, Knowledge Institute of Technology, Tamilnadu, India*

*<sup>4</sup>B.E/EEE Final year, Knowledge Institute of Technology, Tamilnadu, India*

*<sup>5</sup>Associate professor/EEE, Knowledge Institute of Technology, Tamilnadu, India*

### ABSTRACT

Filling is a task carried out by a machine that packages liquid products such as cold drinks or water. Traditional methods of bottle filling involved placing bottles onto a conveyor and filling only one bottle at a time. This method is time consuming and expensive. The present work briefs about a machine that used to prepare automatic filling of liquid in to the bottle of different size is fully controlled by the plc.which acts as the heart of the system. The system sequence of operation is designed by ladder diagram and the plcprogramming software. Sensor usually plays its vital part as an input signal transmitter for the plc in the system. During this project sensor has been used to detect the bottle position that move along the conveyor belt at thelow speed while the machine operates. The input signal that has been sent from the sensor to the plc has being made as a reference. Signal in order to determine the output signal that exactly a same with the plc programming language based on the user requirement. The entire system is more flexible and time saving.

Whereas mechanization provides human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy. One of the important applications of automation is in the soft drink and other beverage industries, where a particular liquid has to be filled continuously. For these kinds of applications. The trend is moving away from the individual device or machine toward continuous automation solutions. Totally Integrated Automation puts this continuity into consistent practice. Totally Integrated Automation covers the complete production line, from receipt of goods, the production process, filling and packaging, to shipment of goods. Our project is also an application of automation wherein we have developed a liquid filling to bottles of different height. The various processes are controlled using a PLC (Programmable Logic Controller).

**Keywords:**PLC ,Sensors, Automation.

### INTRODUCTION

The field of automation has had a notable impact in a wide range of industries beyond manufacturing. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization.

### II. LITERATURE SURVEY

1. MALLARADHYA.H.M, K.R.PRAKASH has described as automated liquid filling tobottles of different height using PLC. A total control is made in a filling of different heighthed bottles. Themethodology that included areBottles are kept in position in a carton over a conveyor belt; they are sensed to detect their presence. Capacitive sensors are used for sensing the bottles. Depending on the output of the sensor the corresponding valve switch on and filling operation takes place. If the particular bottle is not present then the valve in that



position is switched off, thereby avoiding wastage of the liquid. The filling process is done based on timing. Depending on the preset value of the timer the valve is switched on for that particular period of time and the filling is done.

## 2.K.ThiyagarajanMeenakshi.

Suganya.Phas done their project on Vision based bottle classification and automatic bottle filling system

In this method, they are fixing the web camera at an optimum location. Where the camera captures the images of logo on the bottle, then logo of the bottle is compared with the reference logo by cross correlation method to classify image. If it is matched, then conveyor starts and by interfacing the MATLAB with arduino, where arduino gets the signal and it sends the signal to the PLC program. After that, PLC allocates time for positioning the bottle to the corresponding valve position. If bottle is positioned at particular valve, then the valve opens for given specified time based on user defined volume selection, to fill the liquid in the bottle.

3.Jaspreetkaurpannuhas described her project asAutomated multiple liquid filling system. On this project they are using the bottle colour to fill the bottle.The proposed system consists of switched mode power supply (SMPS) which activates PLC by generating 24V dc Supply, Siemens S7-1200 PLC is used to control whole process, relays are implemented for isolation purpose. The input is given to PLC by two colour sensors sensing different colours to identify the colour of bottle. There are two solenoid valves employed in the process which actuates the taps of the liquid filling tank, these two are the output devices. The DC motor used to drive the conveyer and the motor is controlled by the relays obeying status given by PLC. The solenoid valves and conveyer motor function as per the commands given by PLC which depends on the status of the two input sensors.

## III. PROPOSED METHOD

The proposed system consists of PLC kit, Relays, Sensors, Solenoid valve, Stepper motor, DC motor, electrode, this system is very much differ from the existing methods, that this method involves in the filling of bottles at different sizes. The method take place by the adding a electrode near to the valve which moves up and down within the bottle, that while the water touches the electrode it gets notified to the PLC and the PLC close the valve ,

the other things are Laser sensors and ultrasonic sensors are used for the bottle positioning. Relays are used which act as the switch which connected to the PLC, through the Ladder Logic the required programming is provided.

Hardware used in the Liquid filling system on various sized bottles comprises of the following components:

1. PLC kit
2. Sensors
3. Relays
4. Solenoid valve
5. Stepper motor
6. DC motor
7. Electrode

### 1. PLC kit



A programmable logic controller (PLC), or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process fault diagnosis.

### 2. Sensors

a sensor is an electronic component, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics, whether as simple as a light or as complex as a computer.



### 3. Relays

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.



A stepper motor or step motor or stepping motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor (an open-loop controller), as long as the motor is carefully sized to the application in respect to torque and speed.

### 4. Solenoid Valve



A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

### 6. DC motor

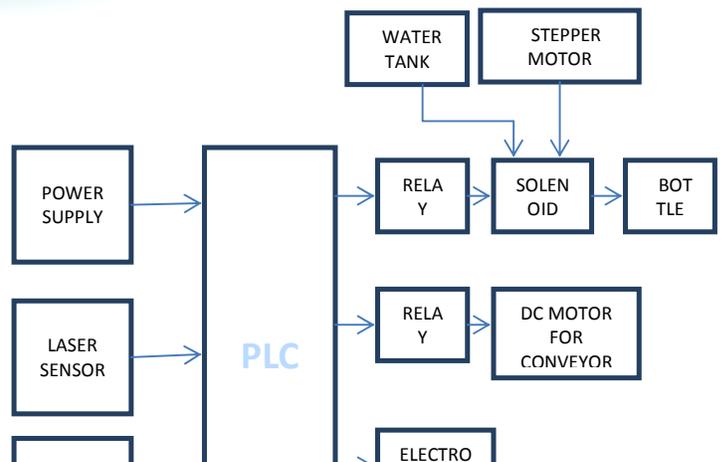
A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

### 7. Electrode

An electrode is an electrical conductor used to make contact with a non-metallic part of a circuit (e.g. a semiconductor, an electrolyte, a vacuum or air).

## IV. BLOCK DIAGRAM

The block diagram of our proposed Liquid filling system is shown in the fig



### 5. Stepper motor



Fig-Block Diagram of the Proposed System

## VI. CONCLUSION

The thesis presents a automated liquid filling to bottles of different height using PLC. A total control is made in a filling is achieved. The present system will provides a great deal of applications in the field of automation, especially in mass production industries where there are large number of components to be processed and handled in a short period of time and there's need for increased production. The programming to this system developed is flexible, quickly and easily. This will increase the total production output; this increase in production can yield significant financial benefits and savings. This concept can be used in beverage and food industries, milk industries, medicine industries, mineral water, chemical product industries and manufacturing industries.

## REFERENCES

- [1] Kelvin T Erickson, "A Programmable logic controllers", IEEE potentials, pp.14-17, march-1996.
- [2] Nabil Shaukat, "A PLC Based Automatic Liquid Filling Process", IEEE.
- [3] Jaspreetkaurpannu "On The Automated Multiple Liquid Bottle Filling System. 2016 International Conference on Circuit, Power and Computing Technologies [ICCPCT].
- [4] Vision based Bottle classification and Automatic Bottle Filling System, International Conference on Advances in Human Machine Interaction (HMI - 2016), March 03-05, 2016, R. L. Jalappa Institute of Technology, Doddaballapur, Bangalore, India

## Biographies



**Manojprasaath.C** is pursuing Bachelor of Engineering in the discipline of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. He is the acting student member of various cells and forums like Power System Engineers Club, Rotract club, Book Lovers Club. He actively participated in Paper Presentation and Project Presentation and He achieved Business English Certification under Cambridge University. He is highly appreciated by the Head of the Department.



**Jayasuriya.Jis** is pursuing Bachelor of Engineering in the discipline of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. He has presented number of technical papers in symposium. He is the acting student member of various cells and forums like Power System Engineers Club, Rotract Club. He won prizes for project contest. He is highly appreciated by the Head of the Department.



**Sapthagiri.A** is pursuing Bachelor of Engineering in the discipline of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. He has presented number of technical papers in symposium. He is the acting student member of various cells and forums like Power System Engineers Club, Rotract Club. He won prizes for project contest. He is highly appreciated by the Head of the Department.



**Tamilmani.S** is pursuing Bachelor of Engineering in the discipline of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. He has presented number of technical papers in symposium. He is the acting student member of various cells and forums like Power System Engineers Club, Rotract Club. He is highly appreciated by the Head of the Department.



**M.Rajendiranis** is currently working as a Professor and Head of the EEE Department at Knowledge Institute of Technology, Salem. He received the B.E. – Electrical and Electronics Engineering from Kongu Engineering College under Anna University, Chennai and M.E.- Control & Instrumentation from Kongu Engineering College under Anna University, Chennai. He has published and presented number of technical papers in National and International Journals and Conferences.