AUTOMATED WATER BOTTLE FILLING SYSTEM

Abdul Faimeed[2], Ambekar Gajanan [1], Adhav Atish[3], Bedre Somnath[4], Bhure Vishal [5]

[2]Professor, [1,3,4,5] Students, Department Electrical Engineering, Government Polytechnic Nanded, Maharashtra, India

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Abstract - : *The automation sector has a significant impact on a wide range of industries besides manufacturing. Automation plays a very important role in the global economy. Filling is a function performed by a machine that packs liquid products such as cold drinks or water. In the past, people had many ways to control the system. More recently, electricity has been used to control and electrical control is based on Microcontroller for various purposes like machines, pharmaceutical plants, chemical plants etc. There Microcontrollers and relays are control the complete working of the system. It is common to use microcontrollers to make a simple decision for reasonable control. Automation in the bottle filling industry comes with growing electrical components. The essential requirement of each component in the system is important to read in order to understand how each component of the system works in coordination with other components of the system. This research mainly involves design, implementation and control for automated bottle filling system. In small industries the task of filling bottles is done by hand. The manual filling process has many shortcomings such as spilled water leaks, delays due to human natural activities etc. This problem faced by small industries compels to design this system. The proposed system is designed for small industries. It aims to eliminate the problems facing the small bottle filling industry. With this automated system, the whole process can be smooth and the refilling process can reduce labour costs and operating costs.*

***Key Words*: Automated, Filling, DC Geared Motor, DC Pump, Conveyor Belt, Arduino, Water filling etc.**

1. INTRODUCTION

The current scenario in industries is to embrace new technologies to proceed towards automation. The same vision is exercised in bottle filling plants. To meet the customer demands and accelerate the filling of bottles, all operations are almost automatic. The automation of bottle filling involves use of PLC for control but is expensive. Despite all these advanced technologies small industries still involved in manual filling of bottles. They may be discouraged to adjust new technologies because of the high costs involved in automation. The study emphasizes cost reduction using Arduino microcontroller and relays. Arduino microcontroller and relays are relatively cheap and widely available. In small industries bottle filling operation is done manually. The manual filling process has many flaws such as spill while filling the bottle, equal amount of water cannot be filled, delays due to human natural activities etc. This work generally emphases on small industries. It aims to eliminate problem faced by small scale bottle filling industry. With this automated system, the whole process can be smooth and the refilling process can reduce manpower costs, operating costs and increase productivity.

2. LITERATURE SURVEY:

We have referred to three research papers VIZ

1).**Bipin Mashilkar, Pallavi khaire, Girish Dalvi,** "Automated bottle Filling System", International Research Journal of Engineering (IRJET), Volume: 02, Issue: 07-Oct-2015.

2).**Mr. Pravin Kalubarme, Mr. Sushil Kumar Madne, Mr. Abhijeet Malve, Miss. Reshma Bagal, Mr. Shivaji Kamble**(March 2018), "Automatic water bottle filling System, International journal of innovations in engineering research and technology(IJIERT), ISSN:2394-3696.

3).**Samarth Nainani, Akshata Rupawate, Shoaib Sayyed, Siddharth Poojary, Vaishali Bodhale,** "Automatic Bottle Filling System using Arduino Uno", International Research Journal of Engineering (IRJET), Volume: 07, Issue: 06- June -2020.

This research paper provided knowledge about Arduino Programing, filling Bottle, Running the bottles using conveyors, working of different Sensors and how micro controller control all the system etc.

3. COMPONENT SELECTION:

LCD (Liquid Crystal Display): LCD is used to notify the water level of tank. We have used 16*4 dot matrix display.it shows some text, mode (ON/OFF, AUTO/MANUAL) of system and water level of tank etc.

DC Gear Motor: A DC motor is the one which converts current electrical energy into mechanical. For pulling of conveyor belt requires motor of high pull out torque. We used one DC gear motor of rating 12v, 100 RPM, 2 kg-cm pull out torque for our project.

DC Submersible Pump: In our Project the pump require for pump the water from tank to filling point for filling the bottle. For our project we used one DC submersible pump of rating 12V, 150 Litre per hour flow rate.

IR Sensors (Infrared Radiation): IR rays can be used to detect the object. IR Sensor consist of two parts which are transmitter and receiver. Transmitter transmit the infrared radiation on object and this radiation reflected, this reflected radiation absorb by receiver and switching action will take place. For sensing the bottle we used two IR sensors.

DC Adapters: For running the whole DC circuit requires regulated dc power supply. For this purpose we used two DC adapters specification of these adapter are as follow:

1). 230V AC/12V DC, 2A. (For operation of DC gear motor and DC submersible pump.)

2). 230V AC/9V DC, 2A. (For operation of Arduino Uno and LCD)

Conveyor Belt: For carrying the bottles from one place to another, safely and efficiently, conveyor belt is used. It is most economical way to transport bottles and also the safest. We made the belt from Poly Fabric Upholstery Rexine, artificial leather sheet of 1 mm thickness.

Relays: In this project many switching action take place according to signal given by IR sensors which is fitted on Conveyor system, for this purpose electrical signal operated switch i.e relay is required. We used three relays of rating 12V DC, 10 A for our project.

Time Delay Relay Module: It is simply control relays with a time delay built in. Their purpose is to control an event based on time. We used this module for on the pump for some time when signal received from IR sensor which is mounted at water filling point.

Arduino: The main function of Arduino in our project is to receive the data from Ultrasonic sensor which is mounted on water tank ,show the tank water level on LCD display and if the tank level less than 20% then off the conveyor motor and ON the Buzzer/indicator. For this purpose we used one Arduino Uno board.

Connecting wires: Connecting wire is used to connecting one circuit to another circuit. We used different colour wire for different components for easy to identifying the circuit connections.

Roller: In our project we used two roller. One for pulling the conveyor belt and another for pushing the conveyor belt. We made this roller by using UPVC pipe(1 inch inner diameter) and Ball(bearings of 13mm inner & 2.27cm outer diameter).motor shaft is coupled with one roller which pull the conveyor belt.

Plastic box: we used one plastic box for enclosing the all electronic circuit.

Plywood: it is used to mount the electrical and mechanical component/circuit/parts on it.

4. SCHEMATIC DIAGRAM:

There are two parts of our project as follows:

4.1 Conveyor System and its controlling Circuit:

This part of System is control the conveyor system and water pump according to Signal given by IR Sensors which are mounted on different location of conveyor system. For making of this part of our system we used one time delay relay module, two IR sensor Modules, 12V DC Gear,100RPM Gear Motor,12V DC Submersible Pump and three 12v relays. Schematic diagram of this part is given as below:
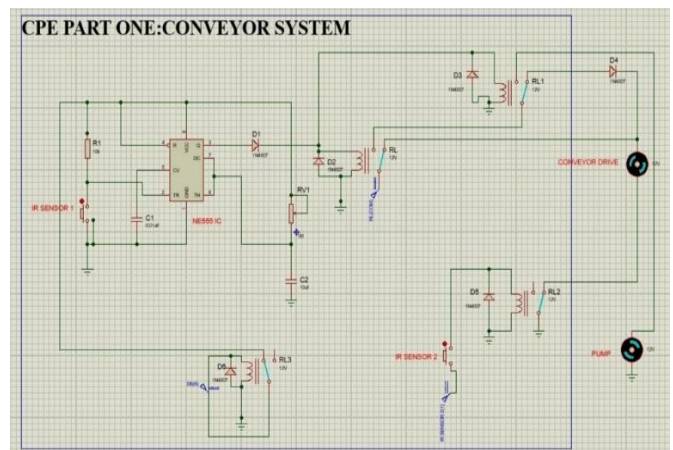

Fig. 1 Schematic Diagram 1

4.2 Water Level Management and its Controlling Circuit.

Function this part of our system is to receive data from ultrasonic sensor which is mounted on top of water tank and display the tank level in percentage with respective tank data received from ultrasonic sensor, System Name, Mode of system on LCD display and if the tank level is less than 20% then give signal to OFF the conveyor Motor through relay and ON the Indicator/buzzer. For making this part our system we used one Arduino Uno Board, One Ultrasonic sensor, one 5V relay module, 16*4 LCD dot matrix display and one red LED/Buzzer etc. Schematic diagram of this part is given as below:
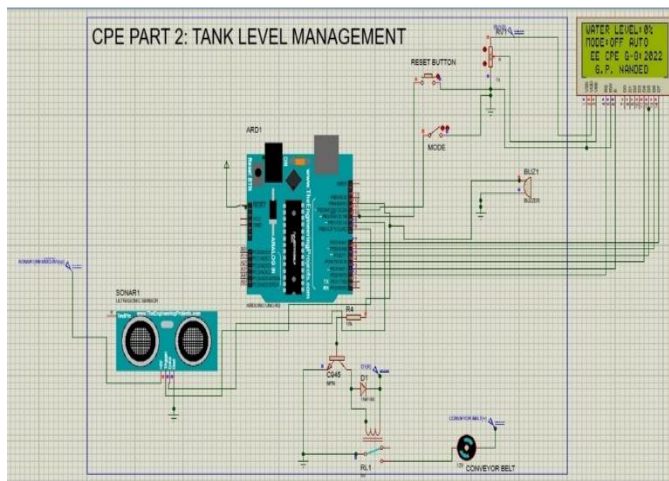
Fig. 2 Schematic Diagram 2.

5. WORKING METHODALOGY:

When Switch ON the power supply, Conveyor belt will start moving and LCD start displaying "System Name, Mode of System (ON/OFF, AUTO/MANUAL) and Water Level of Tank etc." When first bottle sensed at filling point by IR sensor 1 which is mounted at filling point on conveyor system, the conveyor belt stop and pump ON automatically for filling the first bottle. Fill the bottle for user set time. After filling the user feed quantity of liquid in the bottle the pump is OFF and conveyor belt start moving automatically for carrying the second bottle. When second bottle is sensed at filling point by IR sensor 1 conveyor belt stop moving and pump will ON automatically for filling the second bottle. After filling the second Bottle pump will OFF and conveyor belt move for carrying the third bottle.

This process is subsequently repeated until the filled bottle is not sensed by IR sensor 2 which is mounted at the end of the conveyor System. When the bottle sensed at the end of conveyor system, conveyor belt stop moving automatically. If someone remove the filled bottle from end of the conveyor then conveyor belt start moving automatically otherwise it will in stop condition and also it will stop when water tank level is less than 20%.

6. FLOW DIAGRAM:

The main objective of an Automatic Bottle Filling System is to complete the process of filling without human intervention. For achieving this, the machine follows a methodology depicted in the flow chart shown below:
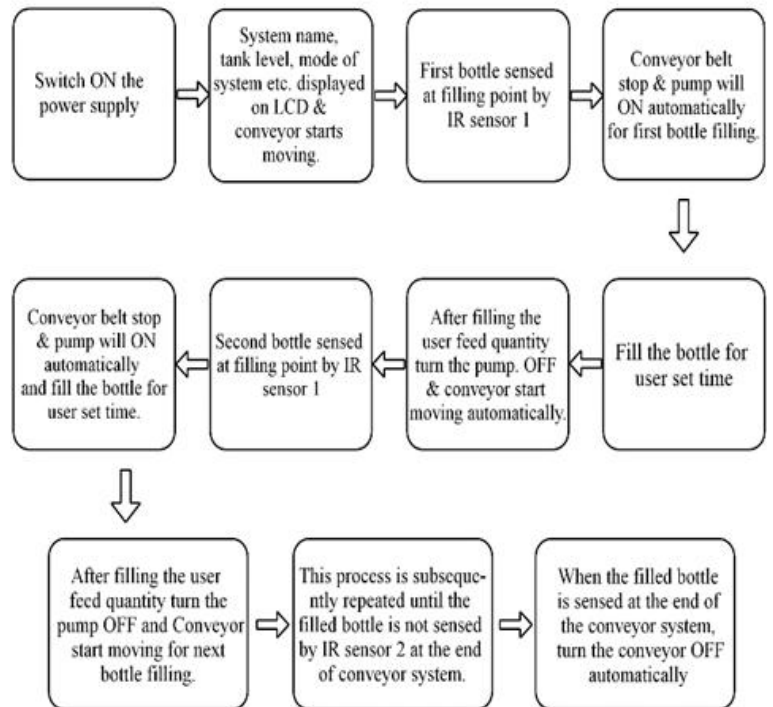

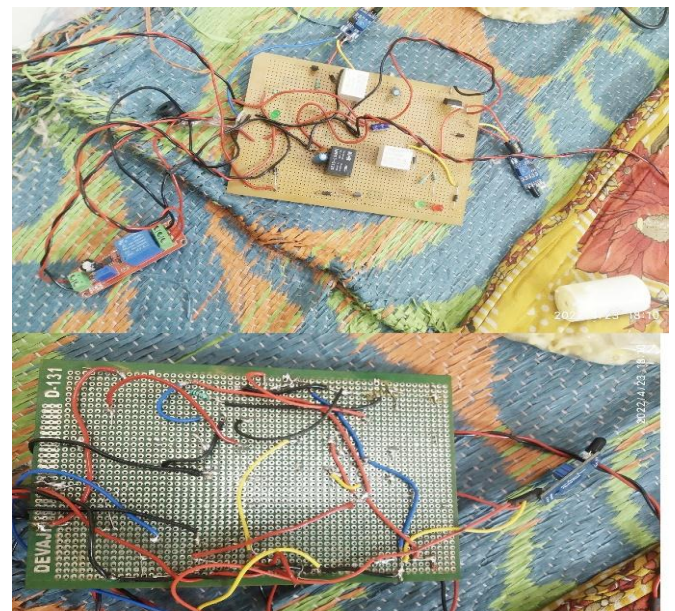Fig.3. Flow Diagram

Photo of Actual Circuit Connections:

Fig. 4 Actual Circuit Connections.

Photo of actual Connection of controlling circuit with Conveyor system and water Pump:

Fig. 5 Real photo while making connections

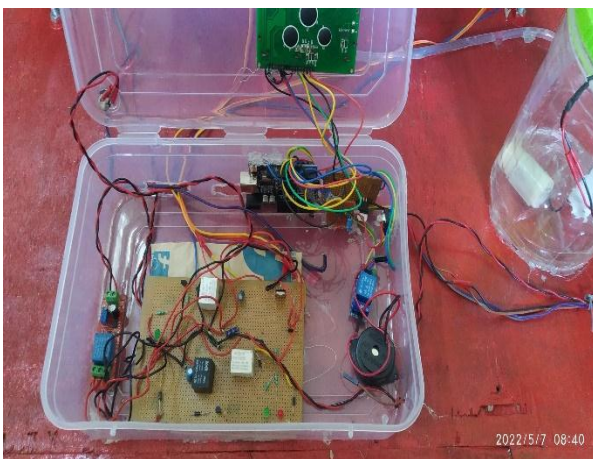**Photo of Actual Circuit Setup:**

Fig. 6 Actual Circuit setup

Advantages of Automated Bottle Filling System:

1. It fill the same volume of Water in each bottle.
2. It require less filling time than manual filling, so it saves time.
3. Cleanliness operation.
4. NO Human Intervention in bottle filling work, so it reduces worker cost.
5. It reduces breakdown time of plant, so productivity of Water bottle filling plant will increases.

Photo of actual Project Setup:

Fig.7 Actual Practical Setup

6. RESULT:

After filling of four to five Bottles using this system we observed each bottle filled with same volume of water and every moving bottle on the conveyor stops to fill properly at filling point and stops even when it reaches the end of the conveyor system, this process happened automatically.

7. CONCLUSION:

In this project conclude that, the automated bottle filling system using pump filling and conveyor belt concept was successfully implemented and studied. This project is very helpful for increasing the productivity and reducing the worker cost of small scale industries where bottle filling work take place manually.

8. REFERENCES:

1).**Bipin Mashilkar, Pallavi khaire, Girish Dalvi,** "Automated bottle Filling System", International Research Journal of Engineering (IRJET), Volume: 02, Issue: 07-Oct-2015.

2).**Mr. Pravin Kalubarme, Mr. Sushil Kumar Madne, Mr. Abhijeet Malve, Miss. Reshma Bagal, Mr. Shivaji Kamble**(March 2018), "Automatic water bottle filling System, International journal of innovations in engineering research and technology(IJIERT), ISSN:2394-3696.

3).**Samarth Nainani, Akshata Rupawate, Shoaib Sayyed, Siddharth Poojary, Vaishali Bodhale,** "Automatic Bottle Filling System using Arduino Uno", International Research Journal of Engineering (IRJET), Volume: 07, Issue: 06- June -2020.