

Automatic Bottle Filling System

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Abstract— This project is aimed at automatic bottle filling system. This project will automatically sense the bottle and filled it properly by using IR sensor. The bottle on the designated portion of conveyor belt and passes it to the water pump to fill the bottles. The overall system is liberated from human intervention. The system is comprehensive and efficient. The bottle filling system serves as an interdisciplinary engineering design.

Keywords: Arduino Uno R3, Ultrasonic Sensor (HCSR-04), (IR) Infrared Sensor, 12V DC Gear Motor, 12V DC

I. INTRODUCTION

The use of automatic filling stations using a conveyor belt system is most economical, fast and commonly used system used in almost all beverages and pharmaceutical (liquid) industries. This project works as a prototype for basic concept of automatic filling stations in beverages, pharmaceutical and dairy process industries.

The objective of the project is to detect the presence of a bottle at the filling station, fill the liquid in the bottle to a certain level and forward the bottle. The project consists of a conveyor belt, for filling of bottles to a required level of liquid, driven by a DC motor at a constant preset speed. The motor will keep driving the conveyor until an infrared (IR) sensor detects the presence of a bottle right below the filling station. The IR sensor sends the signal to the controller which in return sends a signal to the motor to stop. As soon as the conveyor stops, the actuator for filling, i.e. a water pump, turns the filling on. The liquid level in the bottle is continuously monitored using an ultrasonic sensor. A preset required level of liquid is already entered in the controller. The controller compares the instantaneous level to the preset required level. As soon as the desired level is reached, the water pump turns off the filling. When filling stops, the conveyor starts moving so that next bottle can be filled.

II. BLOCK DIAGRAM

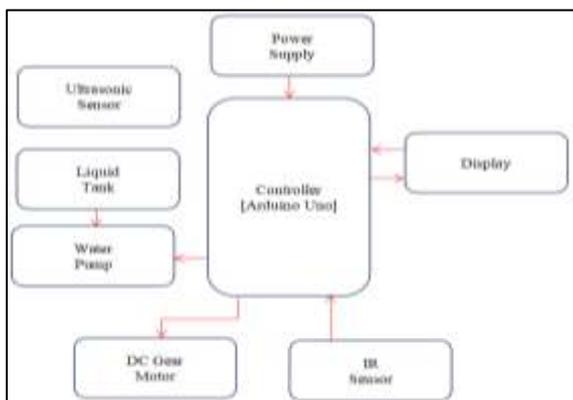


Fig. 1: General Block Diagram of Automatic Bottle Filling System

A. Block Diagram Description

In Fig.1 block diagram shows the automatic bottle filling system. In this the Arduino is the heart of the whole system. When the supply is switch ON the belt is start moving forward and we are placing some bottle on a conveyor belt. Whenever the bottle is in front of 1st IR sensor the motor will turned OFF and the pump is Turned ON and start filling the bottle. After some time delay the pump will automatically turned OFF and the motor will again run the belt to move the bottle forward until the bottle cannot be sense by the 2nd IR sensor. Now the belt is stop to pick the bottle manually similarly the next bottle is under the 1st IR sensor to filled it. And this process is continued. The motor is control by the motor driver IC that is L293D. The ultrasonic sensor is used to measure the water level in the main tank by producing ultra-wave sound. When the water level is under 20% the buzzer indicate to user by giving a beep that main water tank level goes down and it's displayed on the 16*2 LCD display.

III. CIRCUIT DIAGRAM

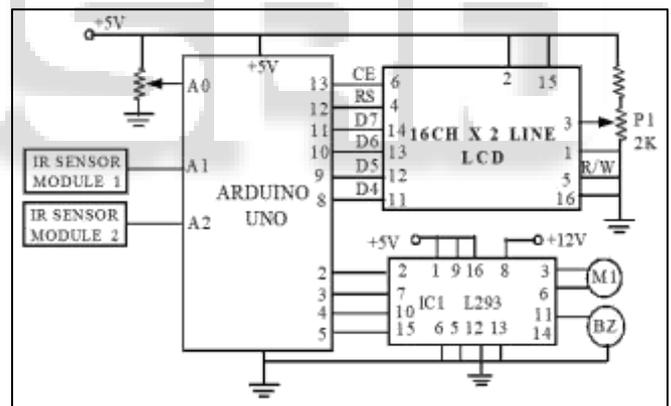


Fig. 2: Circuit Diagram

A. Methodology

Switch ON power supply the motor and the conveyor belt starts moving. The DC motor used is a DC geared type motor whose shaft is coupled directly with the shaft of the roller. This motor has an input voltage of 12v DC with an input current of 0.2A to 1.2A. The reason for selecting this motor is to achieve a high starting torque at a constant speed. It has a torque of 70kgcm. The motor comes with a metal gearbox and side shaft. Shaft is loaded with bearing for wear resistance. The reason for choosing such a high torque is having such heavy rollers used on the either side of the hardware which is mounted with a conveyor belt.

Then two to three bottles is placed simultaneously on the conveyor belt. Now as the bottle approaches towards the IR sensor, the sensor senses the bottle and the conveyor stops running. As the conveyor stops the water pump gets ON and the water starts filling in the bottle. After a given

time period is over, then the pump gets OFF completely and water flowing through the pump is stopped and the conveyor belt starts moving. The pump remains OFF until the next bottle is sensed by the sensor again.

IV. MODEL PRESENTATION



Fig. 3: Model Setup

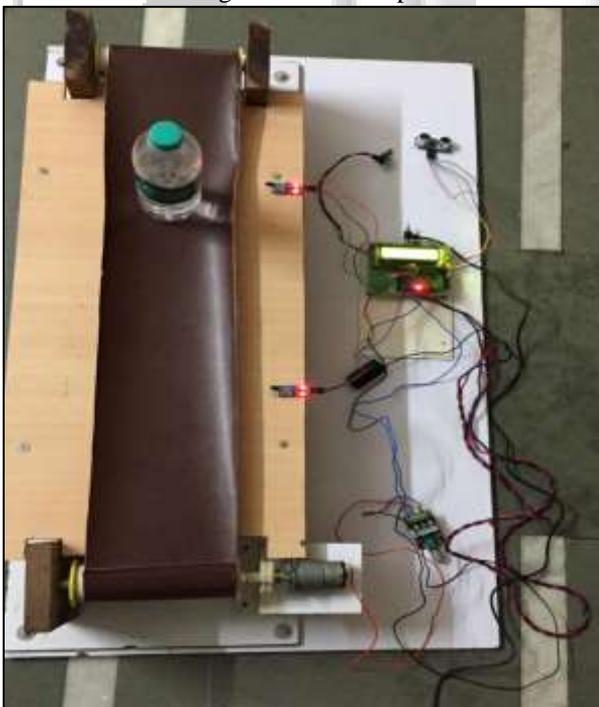


Fig. 4: Model Working

V. ADVANTAGES

- Reduce the human efforts
- Replacing human work by technologies.
- Economy improvement.

- Perform the tasks which are beyond the human capabilities of size, weight, speed.

VI. DISADVANTAGES

- Unemployment increases due to machine replacing human
- Development cost cannot predict.
- Huge initial investment.

VII. FUTURE SCOPE

We did sorting the bottles manually. However, sorting can be improved through image processing. In image processing bottle can be sorted on the basis of colors and shapes.

The second part of our project was bottle filling, for which we used water pump. We did programming in such a way that it actuated the pump for a few seconds. The operation of filling of bottles can be improved by using level sensor.

For further improvement of material handling operations Scara Robot can be used. The robot is very helpful in picking and placing of bottles. But in this project we manually place the bottles on the conveyor belt.

VIII. CONCLUSION

The automated bottle filling system was successfully implemented and studied. The system can perform the task of autonomous quality control system used in industrial production. Our aim of this work is to establish a flexible, economical, easily configurable, reliable system which makes our project eco-friendly.

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