Journal of Basic and Applied Engineering Research
p-ISSN: 2350-0077; e-ISSN: 2350-0255; Volume 5, Issue 3; January-March, 2018, pp. 236-238

http://www.krishisanskriti.org/Publication.html

# Industrial Automation for Bottle Filling using LabVIEW

**Vaibhav Sareen[1], Jalaj K. Chaudhary[2], Ayush Rungta[3] and Preeti Jaidka[4]**

*[1,2,3,4]JSS Academy of Technical Education, Noida*
*E-mail: [1]vbhvsareen@gmail.com, [2]jalaj.chaudhary62@gmail.com,*
*[3]ayushrungta8@gmail.com, [4]preetijaidka@jssaten.ac.in*

**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. Our paper aims at filling and capping bottles according to the color of the bottle simultaneously. The filling and capping operation takes place in a synchronized manner. It also includes a user-defined fluid and volume selection menu through which the user can input the desired volume and the fluid to be filled in the bottles. The entire system is more flexible and time saving. The signal is acquired using Data Acquisition Card (DAQ) and the processing is done using LabVIEW. The main advantage of using this system is that the perimeters can be changed in real time. One more advantage that it offers is the graphical programming interface.*

**Keywords***: DAQ (Data Acquisition Card), LabVIEW (Laboratory Virtual Instrument Engineering Workbench)., Sensors ,USB 6009,Automation, LDS (Laser Detection System)*

## 1. INTRODUCTION

Recently, the whole industrial process and tasks have become thoroughly dependant on automation. Automated systems have wholly replaced the conventional classical system in completing the industrial task.

The reasons behind the increasing use of automation systems in the manufacturing process is that the computerized machines have the ability to do the repetitive tasks in more efficient and effective way. Besides, automated industry need less human operators and can accomplish tasks that the human beings can't do. The aim of this project is to design and develop "Automated Bottle Filling Using LabVIEW". The various modules are interfaced using NI DAQ (Data Acquisition Card) USB 6009 and monitored & controlled using LabVIEW(Laboratory Virtual Instrument Engineering Workbench).

## 2. OBJECTIVE

To develop an automatic bottle filling and capping system with an option to fill 3 different liquids on the basis of the bottle. To also provide with a menu to decide the volume of the liquid to be filled.

## 3. METHODOLOGY

Bottles are kept in the fixtures fixed on the conveyor belt. The presence of bottle is sensed using a LASER Detection System. Based on the output of LASER Detection System the conveyor belt starts moving. Once the bottle reaches filing station it is detected by IR Sensor. The belt stops and the filling starts on the basis of the color of the bottle identified using TCS 3200 Color Sensor. After filling is done the bottle moves to the capping station and the capping is done.

## 4. PROCESS DESCRIPTION

This chapter gives a detailed explanation of the various processes taking place in a complete bottling system. The filling and capping operations take place in a sequential manner.

### 4.1 BLOCK DIAGRAM

The basic block diagram (as shown in FIG. I) of the process and its explanation is given as follows:

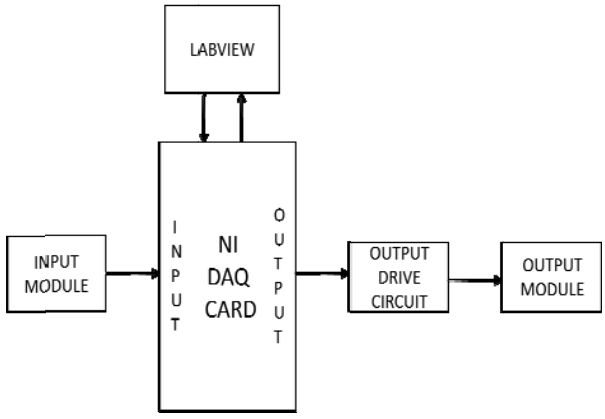



**Figure 1: Block diagram of process.**

### 4.2 INPUT MODULE

The input module includes the LDS, IR sensors and Color Detector. There are two pairs of IR sensors whose output is given as an input to the DAQ Card. The LDS is used to detect the presence of a bottle in the system. One pair of IR sensor which is used to detect the bottles at the filling station and one more is used to sense the bottles for capping operation. The Color Detector is present at the filling station. It provides the data about the color of the bottle to decide the liquid to be filled. Thus, these are the inputs given to the input module.

### 4.3 NI DAQ USB 6009

The USB-6009 is a low-cost, multifunction DAQ device. It offers analog I/O, digital I/O, and a 32-bit counter. The USB-6009 provides basic functionality for applications such as simple data logging, portable measurements, and academic lab experiments. It offers 8 Analog Input pins (14-Bit, 48 kS/s), 2 Analog Output pins (150 Hz) and 13 Digital Input Output pins.

### 4.4 OUTPUT DRIVE CIRCUIT

The output voltage and current of a USB 6009 is insufficient to drive the output module. The output voltage of USB 6009 is 5V (max) and the requirement of output module is 24 V. Hence the output of USB 6009 is used to drive a H bridge IC ( L293D) to control motor and valves.

### 4.5 OUTPUT MODULE

The output module consists of 3 valves and 2 motors. Motor 1 is used to drive the conveyor belt. Motor 2 is used at the capping station for closing the cap. The three valves are used to dispense three different liquids as desired.

### 4.6 LabVIEW

LabVIEW is systems engineering software for applications that require test, measurement, and control with rapid access to hardware and data insights. LabVIEW offers a graphical programming approach that helps to visualize every aspect of the application, including hardware configuration, measurement data, and debugging. This visualization makes it simple to integrate measurement hardware from any vendor, represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces.

## 5. FLOW CHART

The following flow chart explains the flow of control and the sequence is which various processes are carried out in the system.

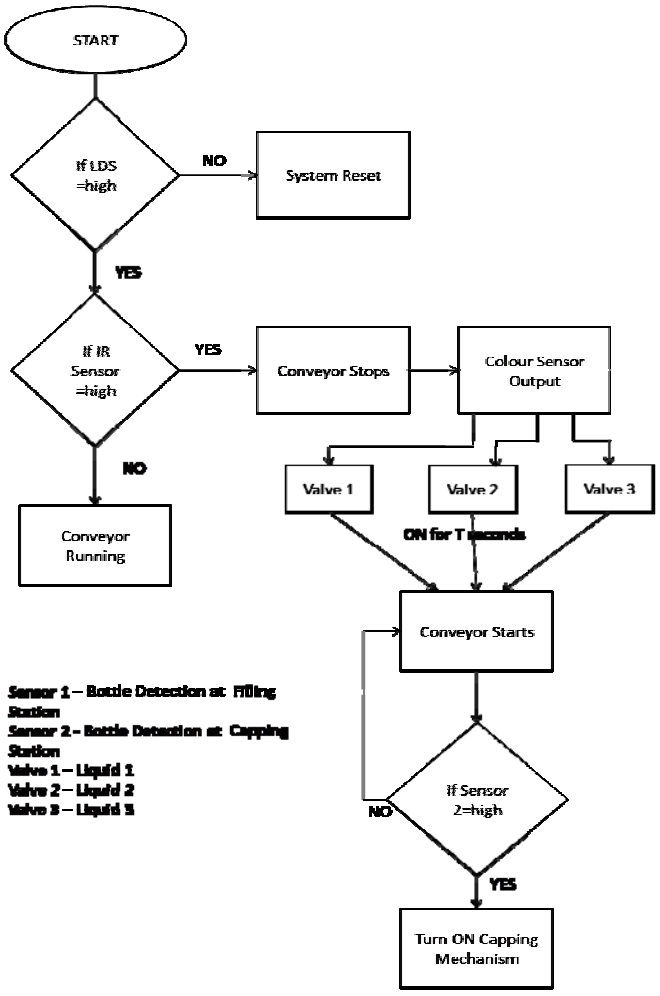



**Figure 2: Flowchart of the processes.**

## 6. SERIES OF OPERATIONS

The complete process is divided into 3 major parts. They are-

### 6.1 BOTTLE DETECTION USING SENSORS

The bottles are placed in the fixtures on the conveyor belt. The presence of the bottle on the track is detected using LDS and the output of the LDS controls the movement of the conveyor belt.

### 6.2 FILLING OPERATION

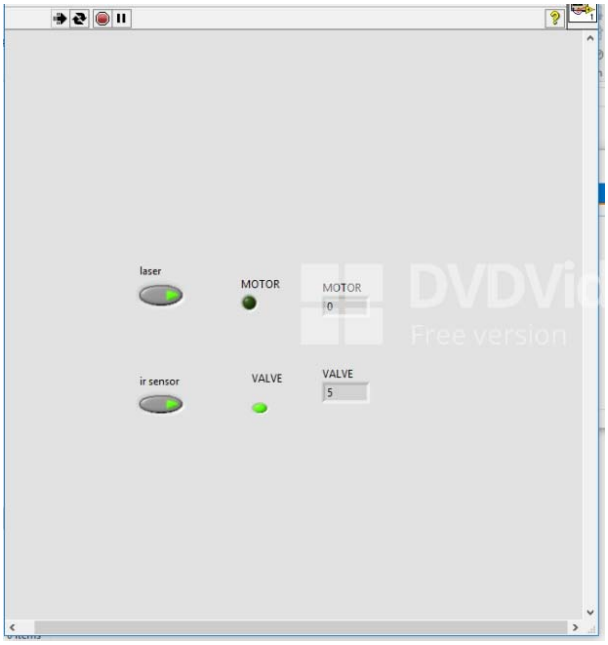
When the bottle reaches the filling station the IR sensor employed there detects the bottle and stops the conveyor. Then the color sensor detects the color of the bottle and opens the specific valve based on the color of the bottle. After fiiling is done the valve closes and the conveyor starts moving again.

### 6.3 CAPPING OPERATION

After leaving the filling station the bottle reaches the capping station. In between this a mechanism is employed to place the cap on the bottle. At the capping station another IR sensor is used to detect the presence of bottle and stop the conveyor belt. Then the cap is fitted using another motor. The entire process repeats itself till no bottle is left on the conveyor belt.

## 7. RESULT

The image below is the control panel of the complete process where a user can change the parameters as and when required.




## 8. CONCLUSION

The main objective of this paper was to develop a bottle filling and capping system based on certain specifications.

This was successfully implemented. We consider this paper as a journey where we acquired knowledge and also gained some insights into the subject which we have shared in this report.

A lot of additional features like user defined volume specification etc. were added in the different stages in our work and the desired results were obtained.DAQ was used to control the various operations and monitoring was done using LabVIEW.