

# Microcontroller Based Automated Solution Filling Module

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**Abstract** - In this era of industrialization, technological revolution/automation is fast shrinking need of humans to assist machinery. This system provides the provision of mixing n number of liquids in any proportion. It's remote control and monitoring makes the system easily accessible and warns the operator in case of any fault. This paper is prototype to massive machines used to fill the liquid in the bottle with a fixed quantity or fixed level, it eliminates and reduces the chances of unevenness from bottle to bottle or inaccuracy which is a very common mistake while filling the bottle manually. The research offers a hardware assembly for a complete production line bottling incorporating the use of microcontroller which results into improved efficiency, energy saving and cost effectiveness.

**Key Words:** Proximity sensors, solenoid valve.

## 1.INTRODUCTION

Automation is the use of control systems and information technologies which reduces the need of human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Where as mechanization provides human operation with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Microcontroller plays an important role in the upcoming world of automation industry. It has replaced the wiring and cabling system that was used in previous era. [1]

Earlier the processes carried out in industries were quite monotonous as a result there was no variation in the production. The research offers a hardware assembly for a complete production line bottling incorporating the use of microcontroller which in turn results into improved efficiency, energy saving and cost effectiveness. This paper is prototype to massive machines used to fill the liquid in the bottle with a fixed quantity or fixed level, it eliminates and reduces the chances unevenness from bottle to bottle or inaccuracy which is a very common mistake while filling manually. It reduces the labour effort as well as make work more accurate and reliable.

## 2. OBJECTIVE

To design a controller system which provides a particular volume of solution, user defined and reduces the labour effort and makes work more accurate and reliable.To build a prototype that will be user friendly, low cost with a transparent structure and compatible for small scale industry.To develop an automatic bottle filling system with a deduction mechanism using sensors. Automatic filling process for all the bottles simultaneously with a user defined selection for volume to be filled.The main objective of this paper is to fill the liquid in the bottles with a fixed quantity or fixed level which will eliminate the chances of unevenness from bottle to bottle or inaccuracy which is a very common mistake while filling manually

## 3. METHODOLOGY

### 3.1 Basic Concept

Bottles are kept in position over a circular disk, to detect their presence. Proximity sensors are used for sensing the bottles. Depending on the output of the sensor the corresponding pumps switch on and filling operation starts. If the particular bottle is not present then the pump in that position is switched off.This avoids wastage of the liquid. The filling operation is accompanied with a user-defined volume selection menu which enables the user to choose the volume of liquid to be filled. The filling process is done which is based on timing. Depending on the preset value of the timer the pump is switched on for that particular period of time and the filling process is done. [2]

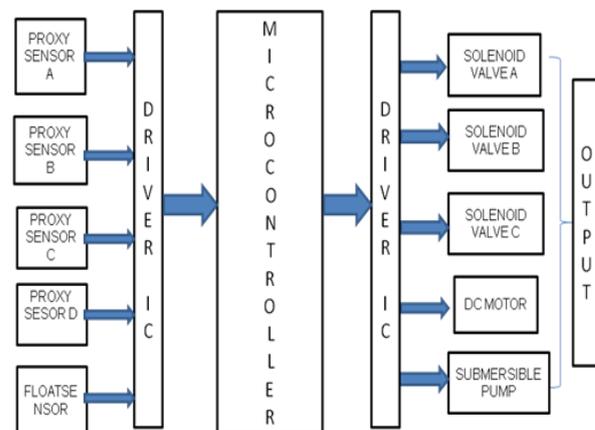


Fig -1: Block Diagram

### 3.2 Input Module

The input module includes the proximity sensors and level sensors. There are four proximity sensors whose output is given as an input to the microcontroller. The three proximity sensors are kept near the input side and bottles are placed on the disk. Thus, these are the inputs given to the input module.

**Solenoid Valve:-**It is an electromechanical 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 case of three-port valve the outflow is switched two outlet ports. Multiple solenoid valves can be placed together on a manifold.

**Microcontroller:-**A microcontroller is a small computer on a single integrated circuit containing a processor core, memory and programmable input/output peripherals. The P89CV51RD2 is a type of 80C51 microcontroller with respectively 64 kB flash and 1 kB of data RAM. It has larger RAM size and the ability to erase code memory in 128-B page blocks. [5]

**Float Sensor:-**Float sensor is an electrical ON/OFF switch, which operates automatically when liquid level goes up or down with respect to specified level. The signal thus available from the float sensor can be utilised for control of motor pump or an electrical element like lamps, relays and solenoid etc.

#### Bottle Detection Using Sensors:-

Bottles are kept on the circular disk on the input side. Proxy sensors are used to detect the presence of bottles. Depending on the output of the sensors the filling operation takes place. A time delay is given in order to set the status of the bottles. If bottle 1 is present the corresponding status bit in microcontroller is set to 1 else it is set to 0. The outputs of these sensors are given to the microcontroller and depending on this output the filling process for the bottles takes place. Thus if all the n bottles are present in the input side then the sensor gives the corresponding output to the microcontroller which in turn switches ON the corresponding pumps for filling operation to take place. If a particular bottle is not present the corresponding pumps remain OFF.[3] [4]

### 3.3 Flow Chart

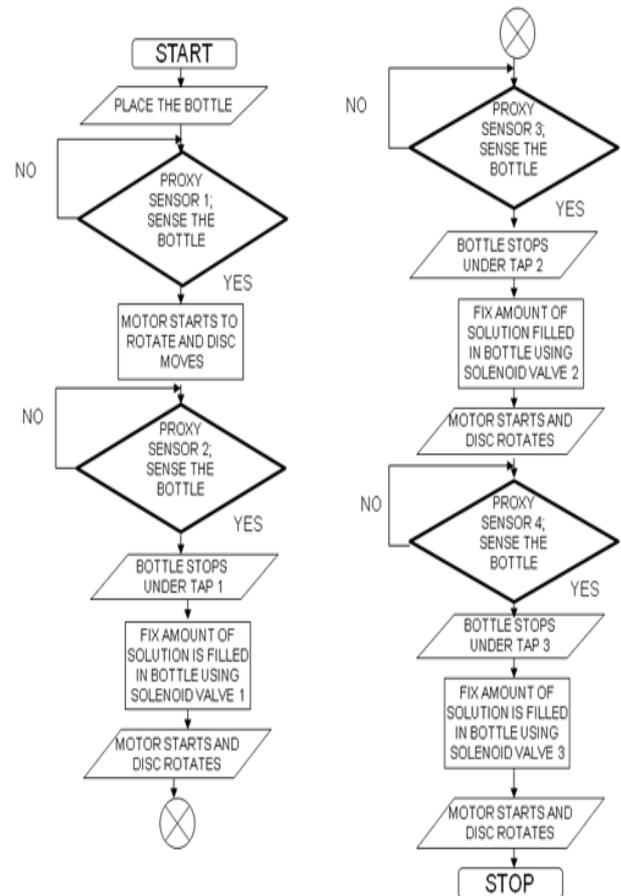


Fig -2 Flow Chart

### 3.4 Software used

The software used in this paper is EAGLE, the Easy Applicable Graphical Layout Editor is powerful PCB design software designed to meet the needs of professionals and engineers .EGALE is powerful and flexible PCB design software which gives high level functionality of expensive commercial circuit board design software at a fraction of the cost for over 20 years. EAGLE is easy to learn, easy to use as well as easy to buy.It runs on Linux, Mac and Windows and allows feature enhancement, for example simulation, data import and export and self-defined commands, through User Language Programs (ULPs) which are partly integrated in EAGLE and available at the download area.

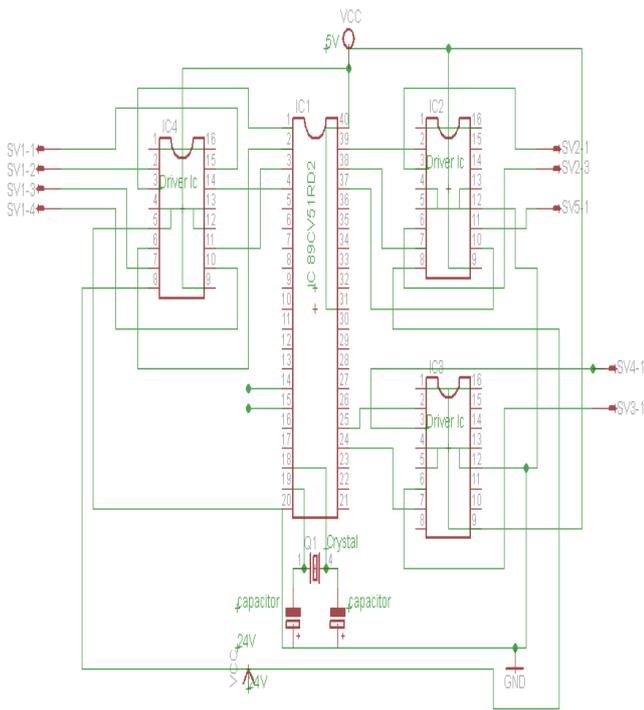


Fig -3 Circuit Diagram

### 3. CONCLUSIONS

The main objective of this paper is to develop a bottle filling system based on certain specifications. We consider this paper as a journey where we acquired knowledge and also gained some insights into the subject. Microcontroller is used to control the various operations and for monitoring.

Bottle filling 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 of this system is flexible, quickly and easily done. This will increase the total production output, this increase in production can yield significant financial benefits and savings.

The performance, flexibility and reliability is based on the investment. The entire system is more reliable, time saving and user friendly.

The system has proved to work effectively avoiding unnecessary spill or wastage of liquids. The system also provides high accuracy and high precision in proportion of liquid mixed. Although proposed system illustrates the mixing process of two liquids any number of liquids may be mixed in varying proportion.

### 4. Future Scope

This system is very useful for future with the help of this system more features can be added to this system. Using appropriate pump, jet nozzle & solenoid valve in which case precise timing is needed would increase productivity. An extended capping & wrapping section could be introduced. More flexibility can be introduced in nozzle positioning. The system can be redesigned for increase bottle size and productivity. This concept can be used in food industries, milk industries, medicine industries mineral water, mineral water, chemical product industries and manufacturing industries. More features can be added to this system as follows: depending on the size, shape and weight of the bottles, filling and capping operations can be implemented. Capping operation can be improvised using a piston arrangement

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