# Liquid filling unit using plc automatically

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Keyword :- An Automation is the utilization of different control techniques for operating equipment's such as operations in factories, aircraft and other applications with reduced human power. The filling process is a mission performed by a machine that fills liquid products such as water or cold drinks. Traditional bottling methods include placing bottles on a conveyor belt and filling only one bottle at a time. In this paper, it has been designed and implement water filling machine system for different sized bottles by using PLC. Where the water filling machine system includes design and implement prototype of a flat belt conveyor with dimensions (120*70*30) cm and automatic process for water filling machine using the solenoid valve and sensors which gives the appropriate information to control unit then design the controller using PLC. The PLC plays important role to implement automatic filling process by using PLC programming software and ladder diagram language. It was found that the water filling machine using PLC is less operational cost and less power consumption than the traditional control systems, in addition more flexible and time saving An Automation is the utilization of different control techniques for operating equipment's such as operations in factories, aircraft and other applications with reduced human power. The filling process is a mission performed by a machine that fills liquid products such as water or cold drinks. Traditional bottling methods include placing bottles on a conveyor belt and filling only one bottle at a time. In this paper, it has been designed and implement water filling machine system for different sized bottles by using PLC. Where the water filling machine system includes design and implement prototype of a flat belt conveyor with dimensions (120*70*30) cm and automatic process for water filling machine using

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**ABSTRACT:-**
In this paper a bottle filling machine is introduced using Programmable Logic Controller (PLC) based controller in automation industry. The main aim of the paper is to design and fabricate a small and a simple filling system using PLC. The belt conveyor is used for moving the bottle. A dc pump is set to tank to control the flow of water. The position of bottle is detected by inductive sensor so that pump can be functioned at right time. When bottle is under the tank, the pump is started and bottle is filled by water. All the components perform well. This filling machine is cost effective and it can be used in small scale bottle filling systems such as coffee shops, juice shops and other beverage industries.
**Key word:-**Automation, Easy technology, Low cost and smooth operation

Industry automation  becomes a spacious field in manufacturing which  had  important role in an extensive range of industries beyond manufacturing [1,2]. Nowadays  the rapid development of manufacturing and technology has led to an increase in production level.. Where the production managers are faced challenged to reduce the cost of the product with maintaining product quality within a time framework and due to the increased demand for on consumer products so competition among manufacturing companies has become dependent on cost, accuracy, time, and quality for that the key to such a problem is the use of integrated processes in the industry[3]. Programmable logic controller(PLC) is extensively used in industrial automation and  it act as a  brain in industry  application. PLCs in the industrial field are utilized to control a certain process in order to get better performance and higher accuracy to give more production in an efficient manner. This paper present, design and implementation water filling machine system for different  sized bottles by using PLC.   The water filling machine system consist of  prototype conveyor section, filling

section with sensors and control section using PLC. The PLC control unit is utilized to reduce the human work and  increasing the production with less time[4]. A water filling

# I.  INTRODUCTION:-

Industry  automation   becomes  a spacious  field in manufacturing which  had important role in  an extensive range of industries beyond manufacturing .Nowadays  the rapid development of manufacturing and technology has led to an increase in production level.. Where the production managers are faced challenged to reduce the cost of the product with maintaining product quality within  a  time framework and due to the increased demand for on consumer products  so competition  among  manufacturing companies has  become  dependent on cost, accuracy, time, and quality for that the key to such a problem is the use of integrated processes in the industry. Programmable logic controller(PLC) is extensively used in industrial automation and it act as a brain in industry  application. PLC in the industrial field areutilized to control a certain process in order to get better performance and higher accuracy to give more production in an efficient manner. This paper present, design and implementation water filling machine system for different sized bottles by using PLC.    The water filling machine system consist of prototype conveyor section, filling section with sensors and control section using PLC. The PLC control  unit is utilized to reduce the human work and increasing the production with less time[4]. A water fillingmachine with PLC controller allows the user to choose the size of bottles with helping the sensors. The filling process is based on the selection of the size of the bottles by the user, through which the user can select the size of the liquid to be filled. A inductive sensor is placed on the conveyor to sense the location of bottle under the valve  and  the  corresponding valve is switched on to fill the bottle by using control unit. In this paper, first present a short introduction about conveyor system and the filling system and the second part talk about the hardware system and the programming of  PLC

# II.  OBJECTIVE:-

The objective of our project is to design, develop  and  monitor  "Automatic  filling systemusing PLC". This work provides with a lot of benefitslikelow power consumption, low operational cost, less maintenance, accuracy and many more. This project is based on Industrial automation and is a vast application used in many industries like milk industries, chemical, food, mineral water and many industrial manufacturers. A prototype has been developed to illustrate the project

### III.   DESCRIPTION OF CONVEYOR SYSTEM:-

Nowadays with many industrial applications, a conveyor system is used to move object from one location to another in effective way to reduce losing time and effort and it is very useful in packaging process. A conveyor system has several forms  but in this  paper, a Flat belt type is used  to  move the bottles as shown in Fig.(1). Conveyors are especially useful in applications which including the transportation of heavy or large materials. A Flat belt conveyer has a dimensions of (300*40)mm the belt is made from elastic material.  Six pulleys a distributed along the belt, the first one rotates with the rotation of motor shaft and it usually called drive pulley and the other five pulley called idler pulley[4]. The Flat belt is fitted with aluminum plate between the pulleys to support the belt



### IV.   SOFTWARE PART:-

In software part we are going to discuss about the programs and the logics used. There are some programming languages for control systems: Block diagram (BD) Ladder diagram (LD) In our proposed device the Ladder Diagram (LD) is used. This  is  to  interface  the  ONOFF  button, programming logic. There are several programming softwares available but in our device ladder logic is used. It is easy to understand and the programming is made more flexible to users.

### V.   LADDER LOGIC:-

Ladder logic is the main programming method used in PLC. Ladder logic is based on mimic relay logic. The relay logic diagrams are difficult, hence we have selected ladder logic as main programming method. In modern control systems they used relay but these are not used for logic. A relay is a device that controls a switch using magnetic field. Relays are used as one power source close a switch for another power source, while keeping isolated

### VI.   HARDWARESPECIFICATION :-

1)   **PLC**: -
A programmable logic controller (PLC) is an industrial digital computer which is used in various and they act as the brain of the devices where they are used. With PLC the revolution in industries is changing very rapidly and with its effort they are helping industries to move towards automation. They are used in industries where the filling bottle, also used in traffic controlling system. The PLC is used because they are the controller of the devices in which they are used. PLCs are used to produce the output in a specific time and so they are the examples of "Real time system". After using PLCs in various applications, it helped to replaced hard wired relays.



2)   **Relay**:-
These are electromagnetic switches which are coiled. When a voltage is applied to a coil the magnetic field is generated and this field sucks the contact of the relay in causing them to make a connection. From here only, the concepts of NO (normally open) and NC (normally closed) has appeared in PLCs.



3)   **Geared Dc Motor :-**
12Volts 100RPM geared motors used for the robotics applications and has approximately weight of 125grams.

4) **Inductive Sensor**: -
It is a type of photoelectric sensor which detects objects, and checks either any changes on the surface conditions. Mainly it consists of an emitter and receiver which emits and receives the light respectively
.



5) **Conveyor Belt:**-
It is a type of flexible belt which slides the object placed on it from one point to another point to perform the task. The belt is in a loop form and it works with the help of using geared motors.
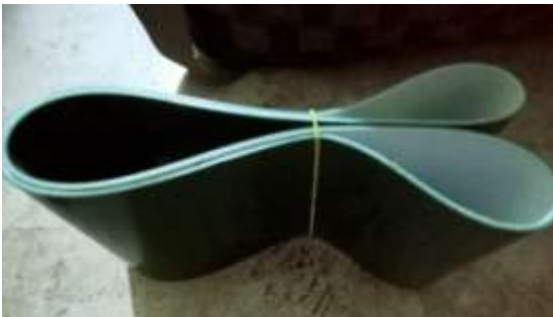


6) **Water Pump:**-
This is a mini size water pump that works on 12V DC. It is extremely simple and easy to use. Just connect the inlet to a water source, connect a suitable pipe and power the motor to start pumping water. Great for building science projects, fire-extinguishers, fire fighting robots, fountains, waterfalls, plant watering systems etc.



7) **SMPS**:-
[ 1) i/p 230 V AC o/p 24V , 5A DC , 2) i/p 230V AC o/p 12 V 5A DC ] is **an electronic power supply system** that makes use of a switching regulator to transfer electrical power effectively. ... An SMPS adjusts output voltage and current between different electrical configurations by switching the basics of typically lossless storage such as capacitors and inductors.



8)**Ball Bearing:**-
A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reducerotational friction and support radial and axial loads.
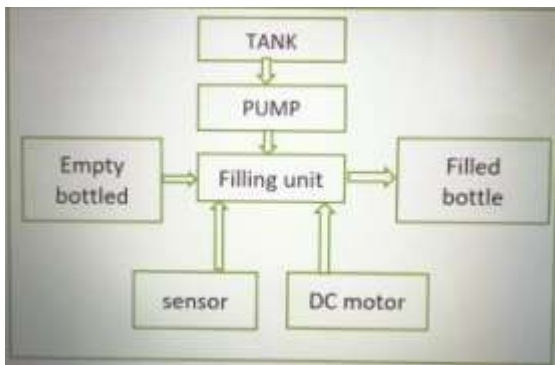Specification:-bearing no. 6202-2z

**9)Selector Switch :-**

The key-operated selector switch is used for safety-related issues. The key can be removed in various positions and when it is removed no other action can be done.
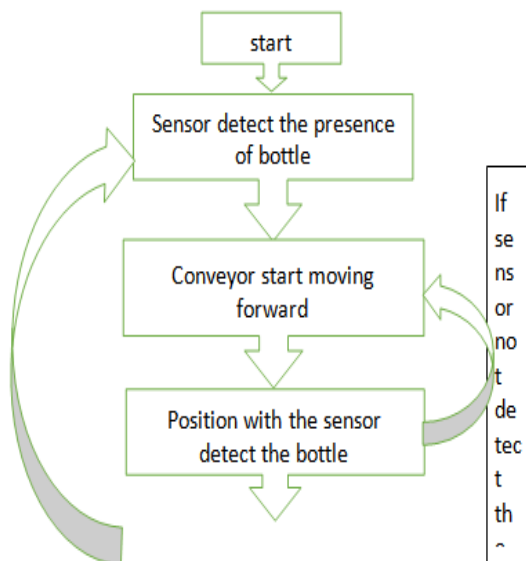
It  is used for select the mode auto/mannual

## VII.    BLOCK DIAGRAM:-

## VIII.    FLOW CHART:-

## IX.    WORKING PRINCIPLE:-

If the button of the power supply is pressed, the conveyor motor will start to move. When the Inductive sensor detects the bottle, the conveyor motor stops to move and the dc pump will start to flow the water to fill the bottle. After completing the filling operation, the dc pump stops. Hence the conveyor motor starts to move and the bottle goes away from the dc pump. This process will be repeated if another bottle is sensed

## X.    ADVANTAGES:-

- Multi  purpose – Due to this is  two 2 types of liquid filling machine
- Time saving – due to automatic operation of machine we save the time
- reduce man power
- Increase the machine efficiency.
- Flexibility & convertibility in manufacturing process

## XI.    FUTURE SCOPE:-

Now a day automation is used in Such company for increase the production and reduce the manpower in future all the company get automation using PLC and get low maintenance losses on production .we are trying to make multi purpose machine for production purpose this is very needful to small scale industry .

## XII.    CONCLUSION:-

An automatic water filling machine system for different types bottles by using PLC has been developed and implemented. The PLC is used in  this system  to get more productivity with less time high reliability for and flexible in work. The system is designed to working with different types bottles by simply change the program. The ladder diagram language is used in this paper because this language is very useful and has a lot of functionsso that most of the industrial application uses this language.

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