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AUTOMATIC CONVEYER BELT FOR WATER FILLING

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Abstract : In the present world of industrialization with the modernization of societies, it has now become a challenging problem to fulfill the need of the people. Presently the task to obtain the output and provide for demand is among the adversaries in a present scenario we need to do something to improve and to be a part of this modernization.In this project, we are implementing an **"**Automatic Conveyer Belt For Water Filling**"** and are dedicating it to the industries. In this project, we are using a Microcontroller which is the brain of this entire project. The main work it will do is filling bottles used in industries for various purposes such as pouring fluids (such as milk, water, etc.) into a packing bottle, and toxic chemical contains ordering in bottles without any injuries.

Index Terms **- Micro-Controller, Dc Motors, Automation, Rela.**

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 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 machineThey use advanced technology to measure and dispense liquids with accuracy and speed. Automatic bottle- filling machines are used in a range of industries including beverage, food, chemical, and pharmaceutical. They offer many benefits such as improved accuracy, increased production speed, and reduced labor costs. Microcontrollers are computer systems containing a processor, memory, and peripherals that are designed to control a particular set of tasks. They are used in a wide variety of products from everyday household items to sophisticated industrial control systems.Microcontrollers are typically programmed in a high-level language such as C/C++, but some may also be programmed in assembly language. They can interact with their environment through digital inputs, analog inputs, and digital outputs.Microcontrollers are used in many embedded systems to perform specific tasks, such as controlling motors, managing communications, and monitoring sensors.

1.1 ADVANTAGES OF MICROCONTROLLER

1. Microcontrollers offer several advantages over traditional processors, including increased efficiency, cost savings, and enhanced performance.
2. They are used in a variety of applications, such as data acquisition and control systems, embedded systems, automotive systems, and robotics.
3. Microcontrollers are capable of handling a variety of instructions quickly, allowing for faster and more efficient data processing. Also, their small stature facilitates them ideal for applications where space is at a premium.
4. Additionally, they are reasonably priced in comparison to other types of processors, making them an attractive option for those on a budget.
5. Finally, microcontrollers are highly customizable, with several different configurations available to meet specific needs.

1.2 APPLICATIONS OF MICROCONTROLLER

1. The automatic bottle-filling machine is widely used in the pharmaceutical, chemical, food, beverages, water industries, etc.
2. Automotive engine control systems, implantable medical devices, remote controls, office equipment, appliances,

And power tools are just a few examples of products and gadgets that utilize microcontrollers, toys, and other embedded systems.

II. LITRATURE REVIEW

2.1 Title: Automatic Bottle Filling Machine Using Plc Author: Yusuf Gultekin and nihan yilmaz Publication date: august 27,2020

This study presents a design of an automated bottle-filling machine using a programmable logic controller (plc). The system is designed to fill bottles with liquid, check for leakage, and control the motor speed of the system. The system is composed of three main parts; the plc, the motor, and the sensors. The plc is used to control the motor speed and sensors, while the motor is used to drive the conveyor belt and bottle-filling system. The sensors are used to detect the presence of bottles and detect leakage in the bottles.The system is designed to be a cost-effective and reliable solution to bottle-filling processes. The design is also capable of being easily customized to meet the needs of different applications. The study also presents a simulation of the system and its performance. The results of the simulation show that the system can accurately fill bottles with liquids without leakage or errors. The study also provides an analysis of the system's performance and reliability. The results of the study show that the system is capable of accurately filling bottles with liquids without leakage or errors.

2.2 Title: Automatic Bottle Filling Machine Using Plc and Scada author: Subhashish Bose Publication date: November 20, 2012

This paper presents a detailed overview of the design and implementation of an automatic bottle-filling machine using programmable logic controllers (PLCs) and supervisory control and data acquisition (SCADA) systems. The paper begins with a literature review of the various technologies and components used in the design and implementation of such a machine, including PLCs, SCADA systems, and other components such as sensors and actuators. It then describes the design and implementation of the machine, including the selection of components, programming of the PLCs, and integration of the SCADA system. Finally, it presents a discussion of the challenges faced in the process and the results obtained after the successful completion of the project. The paper concludes by highlighting the advantages of using PLCs and SCADA systems in the design and implementation of automated systems, and their potential for further development.

2.3 Title: Automatic Bottle Filling Machine Using Microcontroller Author name: m. V. Kulkarni, Publish date: April 2017

This paper presents the design and development of an automatic bottle-filling machine using a microcontroller. The system consists of a load cell, a gear train, a stepper motor, a control unit, and a user interface. The load cell is used to measure the weight of the bottle and the gear train is used to accurately control the amount of liquid to be filled. The stepper motor is used to control the filling of the bottle. The control unit is responsible for controlling the functioning of the system and the user interface is used to provide the user with information about the status of the system. The system is designed to be able to fill bottles of different sizes and shapes. It also can fill bottles of different volumes. The system is designed to be easy to use and to provide accurate filling of bottles. The system is also designed to be cost-effective and reliable

III. EXISTING SYSTEM

3.1 EXISTING SYSTEM:

1. The existing systems for automated bottle-filling machines typically use either a microcontroller or a programmable logic controller. A microcontroller is a single integrated circuit that contains the processor, memory, and programmable input/output peripherals.
2. A PLC is a programmable logic controller which is a special-purpose computer designed to monitor inputs and outputs and make logic-based decisions for automated systems.
3. The microcontroller is usually used for simpler applications, such as filling bottles with a single liquid, with limited features and options. Both the microcontroller and the PLC are capable of controlling the speed, pressure, and other parameters of the bottle-filling process.

3.2 DRAWBACKS

1. High power consumption: Automatic bottle-filling machines require a lot of energy to power their conveyor belts and filling nozzles. This can be expensive for business owners.
2. Limited scalability: Because the amount of liquid that can be dispensed from each nozzle is limited, it can be difficult to scale up the system to meet increased production demands.
3. Poor accuracy: The accuracy of the filling process can vary depending on the speed of the conveyor belt and the calibration of the filling nozzles. This can lead to inconsistent bottle filling, which can be a problem for businesses that need precise amounts of liquid in each bottle.

3.3 OBJECTIVES:

- This project is to develop a industrial automation system conveyer belt with water filling controlled by microcontroller
- Signal is given through IR sensor to comparator
- Modern industries are gradually shifting from conventional man power to centralized control system.

IV. COMPONENTS OF REQUIREMENTS:

4.1 FRAME:

The frame is made of plywood. It is set flanged all the components like conveyor setup, disc set up, exit conveyor, and Microcontroller board. It's carried for a maximum weight of water bottles, easy to place the components by using bolts and nuts.

Figure 1-Frame material

4.2 MOTOR DC:

An electric motor that transforms direct current electrical energy into mechanical energy is known as a DC motor. The rotor, stator commutator, and brushes make up its components. An electromagnet called the rotor spins inside the stator's stationary magnetic field. As the rotor turns, an electrical current is induced in the commutator, which is then passed to the brushes. The brushes then transfer the electrical current to the rotor, creating a spinning motion.

Figure 2-dc motor

4.3 SHAFT:

A shaft is a common and important machine element. It is a rotating member, in general, has a circular cross- section, and is used to transmit power. The shaft may be hollow or solid. The shaft is supported on bearings and it rotates a set of gears or pulleys for power transmission. The shaft is generally acted upon by bending moment, torsion, and axial force. The design of the shaft primarily involves determining stresses at crier tuckpoints in the shaft that is arising due to the aforementioned loading.

Figure 3-shaft

4.4 HOSE AND CONNECTORS:

A hose coupling is a connector on the end of a hose to connect (or couple) it with another hose or with a tap or a hose appliance, such as an irrigation sprinkler. It is usually made of steel, brass, stainless, aluminum, or plastic.

Figure 4-hose

4.5 DC PUMP:

A pump is a device used to raise, compress, or transfer fluids. The motors that power most pumps can be the focus of many best practices. It is common to model the operation of pumps via pump and system curves. Pump curves offer the horsepower, head, and flow rate figures for a specific pump at a constant rpm. System curves describe the capacity and head required by a pump system.

Figure 5-dc pump

4.6 EARING:

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 reduce rotational friction and support radial and axial loads. It achieves this by using at least three races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly

Figure 6- bearing

4.7 CONVEYORS AND ROLLER:

Conveyors are used to moving objects from one point to another. They can be manually or automatically operated and are powered by either electric motors or other forms of power. Conveyors are often used in manufacturing and production processes.

They are also commonly used in the food industry for packaging and sorting. Rollers are cylindrical devices used to rotate or spin objects. When two surfaces come into contact, they can be used to lessen friction and move items in a circular or straight line. Examples of rollers include wheel rollers, conveyor rollers, and FLAT- belt rollers.Rollers are commonly found in factories and warehouses and are used to move heavy materials such as steel, wood, and plastic.

Figure 7- conveyor and roller

4.8 ROTATING DISK:

A Rotating disc made up of plywood, helps to change the direction of water bottles and control the proximity sensor for capping. It's connected to a DC motor and guides the water bottles to the exit conveyor.

Figure 8-rotating disk

4.9 CIRCUIT RELAY:

A circuit relay is an electrical switch that opens or closes a circuit when a certain amount of current is applied to it, allowing it to control the flow of electricity in an electrical system. It is frequently employed to regulate circuits that are too big or intricate for a standard switch to handle. Circuit relays are frequently used in industrial and commercial applications for safety, monitoring, and control, including motor control systems Moreover, they can be utilized in household settings to regulate the flow of power in thermostats, alarm systems, and lighting controls. Circuit relays are an integral part of any electrical system, as they allow for a safe and controlled flow of electricity.

Figure 9- circuit relay

4.10PROXIMITY SENSOR:

Proximity sensors detect the presence or absence of objects without physical contact. They are utilized to calculate the separation between two items and gauge an object's relative position. These sensors are frequently employed to initiate actions, such as opening a door when a person approaches or sounding an alarm when a person enters a zone that is prohibited. Proximity sensors are available in various forms, such as inductive, capacitive, ultrasonic, and photoelectric.

Figure 10-proximity sensor

4.11MICRO-CONTROLLER:

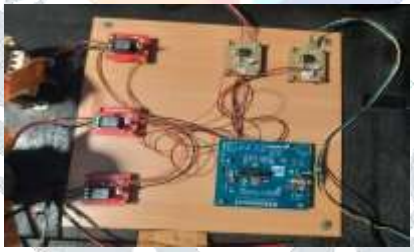

Figure 11-circuit-board

4.12 AT MEGA 328 microcontroller motherboard:

Motherboard is a widely used open-source, affordable microcontroller board for physical computing projects. It is created to work with the Arduino Integrated Development Environment and is based on the atmega 328 microcontroller (IDE).

A potent, 8-bit microcontroller, the atmega 328 may be programmed to carry out several tasks. It can execute fundamental logic operations, convert analog signals into digital signals, and carry out serial communication. The board features a built-in USB port, an integrated voltage regulator, and an onboard power switch. The mega 328 is the foundation of the Arduino board and provides the necessary hardware to support the Arduino IDE and the software libraries associated with the various Arduino boards.

The mega 328 is a versatile microcontroller that is used in a variety of applications, including robotics, home automation, and 3D printing. The mega 328 is a popular microcontroller due to its low cost and reliable performance. It features an 8-bit AVR processor, a 16mhz clock speed, 32Kb of flash memory, 2Kb of SRAM, and 1Kb of EEPROM. The board also has an integrated voltage regulator, an onboard power

1. Atmega328 is an 8-bit, 28-Pin AVR Microcontroller manufactured by Microchip, which follows RISC Architecture and has a flash-type program memory of 32KB.
2. Additionally, the microcontroller has an EEPROM memory of 1KB and SRAM memory of 2 KB. The Arduino UNO's heart, the Atmega328, is found in basic Arduino boards including the Arduino UNO, Arduino Pro Mini, and Arduino Nano.
3. It operates on a range of 3.3V to 5.5V, with 5V being the standard voltage.
4. This microcontroller is cost-efficient and has low power dissipation, a programming lock for security purposes, and a real timer counter with a separate oscillator.
5. It can be used to design a range of practical examples of embedded systems and is typically utilized in Embedded Systems applications.

- **ATMEGA328 pins:**

ATmega-328 is an AVR Microcontroller having twenty-eight (28) pins in total.

ATmega328 Pins			
Pin Number	Pin Name	Pin Number	Pin Name
1	PC6	15	PB1
2	PD0	16	PB2
3	PD1	17	PB3
4	PD2	18	PB4
5	PD3	19	PB5
6	PD4	20	AVCC
7	Vcc	21	AREF
8	GND	22	GND
9	PB6	23	PC0
10	PB7	24	PC1
11	PD5	25	PC2
12	PD6	26	PC3
13	PD7	27	PC4
14	PB0	28	PC5

Figure 12-PINS

- **ATMEGA328 pinout:**

Through the pinout diagram, we can understand the configurations of the pins of any electronic device, so if you are working on any Engineering Project then you must first read the components' pinout.

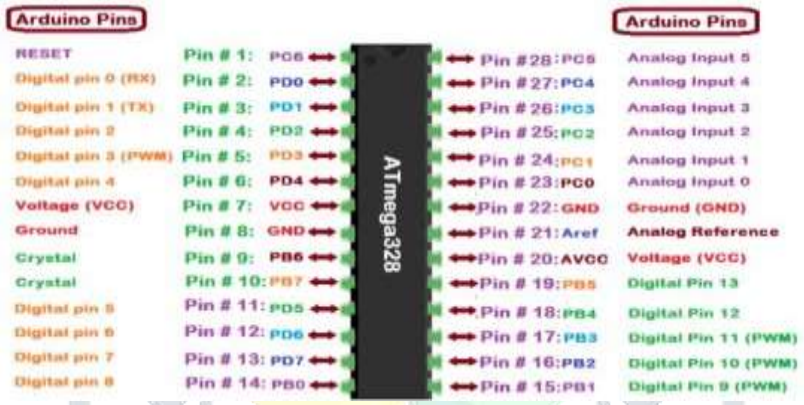

Figure 13-PINS

- **ATMEGA328 pins description:**

Functions associated with the pins must be known to use the device appropriately. ATmega-328 pins are divided into different ports which are given in detail below. VCC is a digital voltage supply. AVCC is a supply voltage pin for analog to digital converters. GND denotes Ground and it has a 0V. AREF is an analog reference pin for analog to digital converters. So, this was the brief of all the pins in the ATmega328 AVR microcontroller.

1. Port A consists of the pins from PA0 to PA7. These pins act as analog input for converters from analog to digital. If analog to digital converter is not used, port A acts as an eight (8) bit bidirectional input/output port.
2. Port B consists of the pins from PB0 to PB7. This port has an inbuilt pull-up resistor and is an 8-bit bidirectional interface.
3. Port C consists of the pins from PC0 to PC7. The port C output buffers provide symmetrical drive characteristics with strong source and sink capabilities.
4. Port D consists of the pins from PD0 to PD7. It is also an 8-bit input/output port having an internal pull-up resistor.

- **ATMEGA328 architecture:**

An architecture of a device presents information about the particular device. ATmega-328 architecture is ATMEGA328 memory:

AT mega 328 has three types of memories,

1. Flash Memory: 32KB. It is a Read-Only Programmable Memory (ROM). This memory is non-volatile.
2. SRAM: 2KB. Stands for Static Random-Access Memory. It is a volatile memory, meaning that after turning off the power, the data will be lost.
3. EEPROM: 1KB. Stands for Electrically Erasable Programmable Read-Only Memory.

- **Power:**

Either an external power source or a USB connection can be used to power the Arduino Mega. The power source is automatically chosen. Either a battery or an AC-to-DC adapter (wall wart) can provide external (non- USB) power. A 2.1mm center-positive plug can be used to connect the adapter by inserting it into the board's power connector.

- **Me***mory:*

An electronic device or system that controls electronic devices is known as a microcontroller.

1. It is a single-chip computer with programmable input/output peripherals, memory, and a processor.

The memory is normally RAM, ROM, or a combination of the two, while the processor is frequently a microprocessor or a microcontroller. Microcontrollers are commonly used in embedded systems, where they are used to control a variety of electronic devices. Examples of embedded systems include sensors, controllers, and actuators.

2. Microcontrollers are also used in a wide range of applications, such as industrial automation, robotics, home automation, and consumer electronics. Microcontrollers are typically programmed using a programming language such as C, assembly, or BASIC.

- **Input and output:**

1. The Arduino Mega2560 has 54 digital pins which can be used as either inputs or outputs.
2. They run at 5V and have an inbuilt pull-up resistor of 20–50 ohms that allows each pin to deliver or receive up to 40mA of current. Some of the pins also serve specific purposes: Serial (RX and TX).
3. External Interrupts, PWM, SPI, and I2C communication, and a built-in LED connected to a pin
4. The higher end of the range of the Mega2560's 16 analog inputs, each offering 10 bits of resolution, can be changed using the AREF pin and analog Reference () function. Additional pins on the board include the AREF pin for analog input reference voltage and the Reset pin for the microcontroller

- **Programming:**

The Arduino software can be used to program the Arduino Mega (download). See the reference and tutorials for more information. The Arduino Mega's ATmega2560 comes pre-burned with a bootloader that enables you to update its firmware without a third-party hardware programmer. It uses the original STK500 protocol for communication (reference, C header files).

- **Automatic (Software) reset:**

The Arduino Mega2560 is made in a way that enables it to be reset by software running on a connected computer, as opposed to needing a physical click of the reset button before an upload. A 100 nano-farad capacitor is used to connect one of the ATmega8U2's hardware flow control lines (DTR) to the ATmega2560's reset line.

The reset line lowers for a long enough period when this line is asserted (taken low) to reset the chip. You can upload code using the upload button in the Arduino environment by using this feature of the Arduino program.

As a result, the bootloader's timeout can be shortened because the upload's beginning and the lowering of DTR can be perfectly timed. This configuration has additional effects. The Mega2560 resets each time a connection is made to it from the software when it is connected to a computer running either Mac OS X or Linux (via USB). The Mega2560's bootloader then starts to run for around a half-second.

The first few bytes of data sent to the board after a connection is established will be intercepted, even though it is programmed to ignore invalid data (i.e., anything other than an upload of new code).

Make sure that the software with which it communicates waits for a second after opening the connection and before sending any configuration or other data when a sketch running on the board initially receives it.

A trace on the Mega2560 can be severed to turn off the auto-reset. To re-enable the trace, solder the pads on either side of it together. It has "RESET-EN" written on it.

V. WORKING PROCEDURE

1. The front of the sensor sometimes referred to as the sensor face, is where infrared rays enter. The sensor is frequently produced as a component of an integrated circuit and can include one (1), two (2), or four (4) pyroelectric material "pixels" of identical size.

2. The sensor pixels can be connected in pairs and used as the opposing inputs to a differential amplifier. An increase in IR energy across the entire sensor is self-canceling. It will not trigger the device in this configuration because the PIR measurements cancel one another, removing the average temperature of the field of view from the electrical signal.

3. If it is exposed to light flashes or field-wide illumination, the device can withstand false indications of change as a result. (Continuous bright light could still degrade the sensor's materials and prevent it from recording additional data.)

4. In addition, this differential configuration reduces common-mode interference, which enables the device to withstand triggering by neighboring electric fields. Unfortunately, in such a form, a differential pair of sensors cannot monitor temperature, hence this setup is only suitable for motion To create a sensor-based automatic bottle filling, capping, and deduction process. Automated filling for all the bottles at once, choosing the volume to be filled based on the user's choices.

5. Bottles are sensed to determine their presence and kept in place in a carton over a conveyor belt. The bottles are sensed using proximity sensors. According to the sensor's output, the appropriate pumps turn on and begin the filling process.

6. To prevent liquid waste, the pump is turned off in such a position if the bottle is not there. A user-defined volume selection menu is available alongside the filling action, allowing the user to specify the amount of liquid to be added.

7. The filling procedure is identical in terms of timing. Depending on the preset value of the timer the pump is switched on for that particular period and the filling is done.

8. While the bottle is in the tank, the pump is turned on to fill it with water. The bottle is then sealed using a piston rotation system before being labeled. This filling device is affordable and suitable for small-scale bottle- filling operations in the coffee, juice, and beverage sectors.

VI. RESULT

1. Finally, we have done by discussed project and it will yet to complete,
2. And we are finally developed mechanical cap-dropping setups, and then also developed plc software to the microcontroller software.
3. The microcontroller also monitors the operation of the system, ensuring that it is running safely and efficiently.
4. And we are introducing new technologies in the product demand increases which tends to increase its productivity and continuous setup of the capping process

VII. CONCLUSION

The main objective of this paper is to develop a bottle-filling system based on certain Specifications. More features can be added to this say as follow Depending on the size, and shape weight of the bottles, Filling is implemented. And we researched concepts and also implemented continuous setups for Capping operations that can be done using a linear actuator arrangement by demo.

VIII. REFERENCES

[1] PLC Based Automatic Bottle Filling and Capping System with User Defined Volume Selection "T. Kalaiselvi, R. Praveena, Assistant professor, Easwari Engineering College, Chennai. International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459)2012.

[2] "Implementation and performance analysis of bottle filling plant using ladder language" 1 SavitaM.tech, R.N College of Engineering & Management, Rohtak, India.2 Lokeshwar Assistant Prof, R.N College of Engineering & Management, Rohtak, India. International Journal of Science and Research (ISSN 2319- 7064) 2012.

[3] "Industrial Application of PLCs In Bangladesh" 1 Ahmed Ullah AbuSaeed,2 Md. AlMamun,3 A.H.M. ZadidulKarim, Department of EEE, University of Pacific, Dhanmondi, Dhaka. International Journal of Scientific & Engineering Research (ISSN 2229-5518)2012.

[4] Arif Ozkan, Kerim Cetinkaya, 'Process Automation and Mixture Filling System Design, Journal of Engineering Research and Applied Science, Volume 1(2), December 2012, pp 98-106.