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Automatic Water Monitoring and Control Used in Retort System

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ABSTRACT: Many industries today are semi-automated and require human labor to complete certain business processes. In today's industrial technology, much depends on automation and control systems. Automation and control systems refer to the use of various controls to operate equipment. We need to know some of the problems in the food packaging industry. Examples include hand pumps, valves, and air compression chambers. Among these problems, we must solve the control pump and the automatic control pump, and use the water meter. A device that displays the water level in the tank. One of the waste products we face is water. This project is designed to help identify and display the water level in the tank while preventing water from flowing, this is done with the Arduino Uno. An ultrasonic sensor is used to determine the water level in the tank sent to the Arduino Uno, and then the LCD connected to it shows us the water level. -/-In this way, we aim to save energy and natural resources with the automation of water management.

KEYWORDS – Automation, Arduino UNO, Manually Controlled pumps, Water level monitoring.

I. INTRODUCTION

i. Background of Study

Automatic water meters using ultrasonic sensors are effective and accurate tools for measuring water levels in tanks, reservoirs and other water storage facilities. The system uses an ultrasonic sensor to measure the distance between the sensor and the water surface, and then calculates the water level based on the measurement. The need for automatic water level meters stems from problems with water level control. Bookkeeping requires human intervention, which can be time-consuming, costly, and error-prone. Also, manual monitoring for large pipelines is often impractical as access to regular water levels can be difficult.

Sensor selection: The project can include an evaluation of different types of ultrasonic sensors available in the market and selecting the most suitable one based on its performance, accuracy, and cost.

Circuit design: The project can involve designing and building a circuit to connect the ultrasonic sensor to a microcontroller, such as an Arduino, and obtaining the distance measurements.

ii. Problem Statement

The problem statement on the Water Level Measurement Using Ultrasonic Sensor Project can identify the need for a reliable, accurate and cost-effective way to monitor water in a variety of applications. Currently, manual monitoring methods and other arrangements such as float switches, pressure transducers and capacitive sensors are often faulty and flawed. In addition, manual maintenance is time consuming and expensive and not suitable for large water sources. The problem of improper water maintenance can lead to many problems such as water leakage, water leakage, pump failure and water shortage. These problems lead to wastewater, equipment damage and hazards to human health and the environment.

Therefore, there is a need for an automatic water meter that can provide accurate, real-time water measurement and



control in a variety of applications. Automatic water meters using ultrasonic sensors solve this problem by providing reliable, non-invasive and accurate water measurements in tanks, storage facilities and other water tanks. The system can be easily integrated into existing water management systems and provide real-time monitoring and control of water levels. The system can also issue alerts and alerts when there is a shortage or deviation in the desired water level. In general, the troublepoints of the water level indicator using the ultrasonic sensor project can be summarized as the need for accurate, reliable and cost-effective monitoring of water levels in many applications for efficient and effective water management.

iii. Objectives

The project is to measure the distance between the sensor and the water surface in a tank, reservoir or other water tank. Ultrasonic sensors emit high-frequency sound waves that bounce off the water surface and return to the sensor. By measuring the return time of the sound waves to the sensor, the distance between the sensor and the water surface can be calculated. Distance measurement can be used to determine the water level in a tank or reservoir. This information can be used for many purposes, including monitoring water use, investigating water leaks or spills, and better water management.

Also, this project can be used to speed up the tank filling process and alert the user when the tank is full or low, helping to save water and prevent waste.

II. SYSTEM SPECIFICATIONS

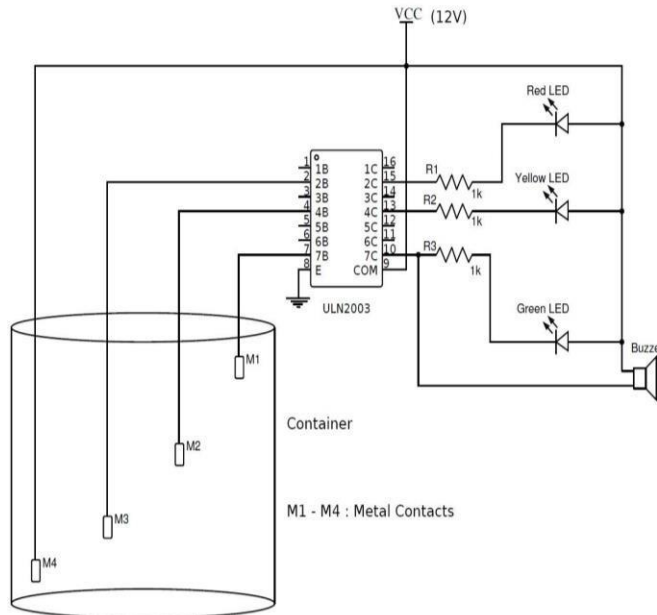
i. Hardware Specifications

1. Arduino UNO
2. Ultrasonic Sensor
3. 16x2 display
4. 2-Channel Relay Module
5. 12V Adapter
6. LED
7. Connecting Wires

ii. Software Specifications

1. Arduino IDE Software
2. MIT App Inventor

III. EXISTING SYSTEM



I. Metal Contact

Water is a very useful resource so we need to be careful with its use and management, a lot of water is wasted due to mismanagement. In this case, we need a water level controller or meter to check or control the water level in the tank to save water. Below I have explained the process of making a simple water level controller using Arduino.

2. How this water level controller works

When the probe of the water tank indicates that the water tank is full, it activates the alarm, beeps and turns off the engine, when the water level rises there is also a soundsignal with a beep. The water level in the tank is low or the sensor or probe is faulty. This project is beneficial for people because it uses the most water, saves energy and the water is always kept at a reasonable level. No need to run them manually, it will work.

3. ULN2003

The ULN2003 is a high voltage, high current Darlington array with seven open collector Darlington pairs, each with a common emitter.

Each channel is rated at 500 mA and can handle a maximum current of 600 mA. Suppressor diodes for the inductive load driver are included and fixed on the outside of the I/O to simplify board layout. Version interface for the entire Universal Logic family: ULN2001 (Target, DTL, TTL, PMOS, CMOS); ULN2002 (14 - 25 V PMOS); ULN2003 (5V TTL, CMOS); ULN2004 (6 - 15 V CMOS, PMOS). These versatile devices can be used to drive a variety of loads such as solenoids, relay DC motors, LED display filament lamps, thermal print heads and high power stoppers. The ULN2001A/2002A/2003A and 2004A are available in a 16-pin DIP package with a copperaluminum frame for low thermal resistance.

They are also available in small packages (SO-16) such as ULN2001D1/2002D1/2003D1/2004D1. The ULN2003 is also available in the TSSOP16 package to reduce the application area.

i. Drawbacks Of Existing System

Environmental factors: Float sensors can be affected by environmental factors such as wind or debris in the water, which can affect the accuracy of the readings. Ultrasonic sensors are less prone to these issues, making them a more reliable option in certain environments.

Power consumption: Ultrasonic sensors typically require more power than float sensors, which can be a consideration if power usage is a concern.

Size: Float sensors are typically larger than ultrasonic sensors, which can be a consideration if space is limited.

Response time: Ultrasonic sensors typically have a faster response time than float sensors, which can be important in applications where real-time monitoring is required.

Compatibility: Ultrasonic sensors are often more compatible with advanced monitoring systems, such as IoT platforms, which can provide more advanced analytics and data visualization.

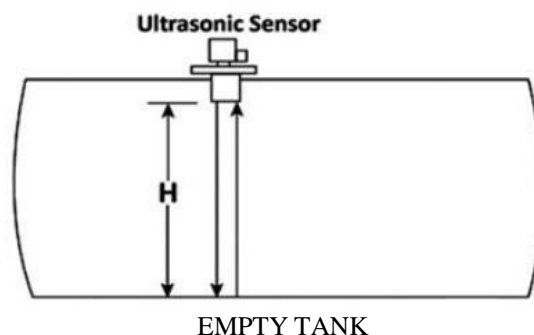
Maintenance cost: Float sensors can be cheaper to maintain over the long term, as they typically require only basic maintenance and repairs.

In summary, while float sensors may be a good option for some applications due to their lower cost and simplicity, ultrasonic sensors offer a wider range, greater accuracy, and more advanced capabilities that can make them a better choice for more advanced monitoring applications. Ultimately, the choice between the two will depend on the specific needs of the project and the environment in which it will be used.

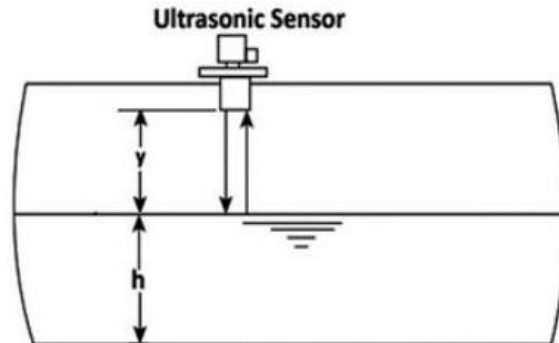
IV. PROPOSED SYSTEM

When the HC-SR04 emits ultrasonic waves and calculates the time it takes for the echo to return, the ultrasonic sensor will determine the distance between the sensor and the liquid. Therefore, during the initial calibration, we must measure the height of the empty tank to know the height

(H) of the tank and how it will withstand the highest and lowest liquid levels. It does this by emitting ultrasound waves that descend to the bottom of the tank and reflect on the Echo pin. The H value only needs to be changed once. Ultrasonic sensor will be mounted on top of the tank as shown in the picture.



As can be seen, half of the tank is filled with liquid, that is, h has been reached and the wave originates from the surface of the liquid and the depth (y) of the space above this liquid has been determined. So far, we get the amount of liquid in the tank (h) by subtracting the height (y) from the total height of the tank (H), which is the height of the liquid inside the tank. We need to distinguish the total height (H) of the tank and the maximum and minimum liquid in the tank. Code from Node MCU.

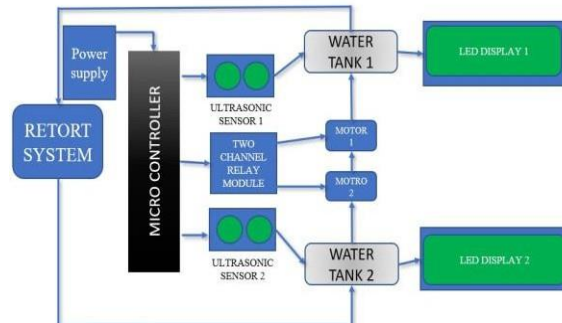


FILLING TANK

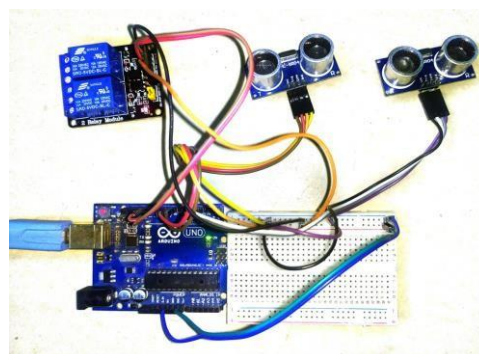
It helps to control the valve by turning water flow on or off as required. The automatic water level controller minimizes the need for any manual switching and human interference. The machine helps to detect level of water or any liquid. The ultrasonic sensor is used to indicate a water level.

Here is a simple water level detector circuit that automatically switches the pump ON or OFF when a preset water level is reached. We have to control a supply of water through this proposing system. Also we have to implement a transferring water into one tank to another tank. It's indicates the water level of tank continuously through the display.

V. BLOCK DIAGRAM OF PROPOSED SYSTEM



In this proposed system the microcontroller connected with two ultrasonic sensors to find a water level in the tank1 and tank 2. Tank 1 and tank 2 are connected through the motor 1 and motor 2. The result is also shown in the 16x2 display module.





The Ultrasonic Water Level Sensor features a robust transducer in a stainless-steel sealed enclosure for long life and provides industry standard 4-20 mA output. Our range of ultrasonic level sensors includes 3 feet, 12 feet and 48 feet to suit a variety of applications. The unique 3-foot range ultrasonic water level sensor is ideal for measuring flow in small bodies of water and pipes. The 12' and 48' ultrasonic level sensors are ideal for measuring water levels in rivers, lakes and tanks, as well as in large tanks. Ultrasonic water level sensors are easy to install and require no programming or calibration. Ultrasonic water level sensors are maintenance Free.



VI. RETORT SYSTEM

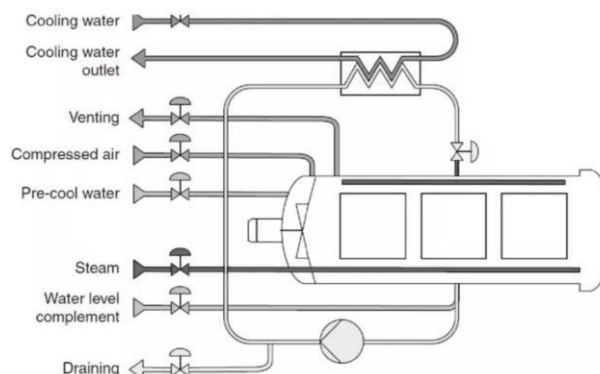
Steam: This is the oldest form of autoclave and is usually a top-loaded, vertical-pressure vessel with straightforward controls. Pressurized steam is admitted to the chamber, driving the air atmosphere out of the top of the vessel in a ‘vent’ phase lasting up to ten minutes. This valve is then closed, and the temperature is raised by injecting steam, creating overpressure from the temperature increase. Thus there is no independent control of temperature and pressure. Because the gaseous medium is not mixed or agitated, air must be eliminated during the venting phase to ensure no ‘cold spots’ – pockets where the temperature is significantly lower due to stratification – since air and steam do not readily mix without assistance.

Key Features:

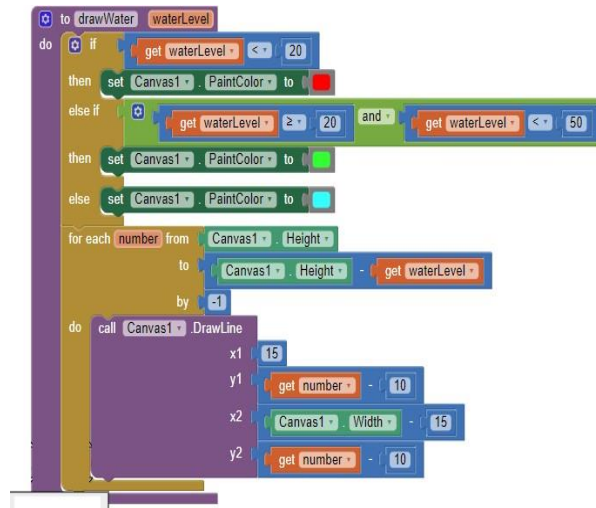
- Long range, short dead band
- 4-20 ma Transmitter
- Durable sealed housing for wet or dirty applications
- For monitoring water level in tanks and open channel.

Steam / Spray: This is a new addition to the cooking process. In 1983, Surgery of Spain developed a technique that combines air and water in an atomized medicine.

The negative environment provides the best heat transfer during the rising or warming phase of the containers, because water changes temperature very quickly.



VII. MIT APP INVENTOR



Rainwater or waterfall: Rainwater or waterfall uses water that is heated under pressure to sterilize it. The water is heated by the heat exchanger, pumped through a distribution plate and sprayed under reduced pressure into the box below. This method is widely used in glass containers because as water falls, it can pass through the containers and transfer heat from the side walls of the containers. In 1975, the French barramundi first introduced the use of cascading water. The heat exchanger in the loop allows the steam to heat the process water as well as the condensate which will be returned to the boiler for reheating.

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