A Review on Water Level & Quality Monitoring System

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***Abstract* - Water is one of the important natural resource. Many times in household, apartments and offices water is wasted unknowingly. This leads to water scarcity. So, water level monitoring is utmost important. As this prevents wastage of water, saves man power and electricity. Level control is one of the most important tasks for the process control engineer. Level control is one of the most important applications in chemical process industries, food beverages industries, pharmaceutical industries, nuclear power generation plants etc. Therefore, there is a need to maintain a constant level of fluid when the fluid inflows and outflows the tank in these industries. Water quality affects the aquatic life and influence the human health, so water quality monitoring is crucial. This paper focuses on literature review of water level and quality monitoring.**

Keywords* - *Water level; Water quality; Ultrasonic sensor, Arduino; LABVIEW; pH sensor; Turbidity sensor;

I. INTRODUCTION

The daily routine starts with water. It is one of the basic needs to survive. People depend on overhead tank for their daily usage. The overhead tank is made of opaque material to prevent algae growth and is closed with lid to protect from dust, mosquito infestation. So, the water level present in the tank is unknown. Many times we switch on motor and forget to turn off, because of this most of the water will be wasted unknowingly. This leads to water scarcity. So, there is need for alternative which can automatically turn on, off the motor when water is filled up to the desired level. Ultrasonic sensor provides non-contact water level measurement. Water parameters such as pH, turbidity affects water quality. Turbidity, pH sensor helps in monitoring water quality.

Water level monitoring is commonly used in some of the applications like Flood monitoring, River level monitoring, Wetland studies, Tidal studies, Groundwater monitoring, Surface water monitoring. Clean water is essential to sustain life and quality of water plays a vital role in the well-being and health of human beings. The objective of this paper is to review water level and quality monitoring.

This paper is organized as follows: Section II discusses the complete literature review on water level and quality monitoring; Section III illustrates the proposed methodology and Section IV concludes this paper.

II. LITERATURE REVIEW

The prototype was developed using microcontroller, pH and turbidity sensor. The water level was indicated using LED's and pumping was done automatically by the controller. Water quality was tested by pH, turbidity, temperature sensor in real time and was monitored by agent. For leak detection in water pipes force sensitive resistor (FSR) was used [1].

A liquid level monitoring system was developed using electromagnetic valve, float sensors, MATLAB, LABVIEW to maintain liquid level close to the reference level. The restrictions imposed by configuration and working of float sensor leaded to non-achievement of control of 2 levels [2].

Automatic water level indicator was developed using arduino, ultrasonic sensor and GSM. The water level was sensed by ultrasonic sensor and accordingly the motor was switched on and off automatically, SMS alert was sent to user [3].

The water level detection system was designed using ping sensor, microcontroller AT89S51. The water level was measured by ping sensor and the data was sent to receiver module by transmitter module via wireless communication [4].

The prototype was developed using ultrasonic sensor, nodeMCU, LABVIEW. Ultrasonic sensor measured water level. The sensed value was sent to Google cloud platform by nodeMCU. In the LABVIEW front panel the webpage was accessed and accordingly the water level was monitored by adjusting the valves [5].

The system was developed using ATMEGA328, ultrasonic sensor, buzzer, Xilinx. Three tanks were utilised with corresponding ultrasonic sensors. Arduino was the controller. When system was turned on water flows through tank1 after, that tank2 was filled and buzzer was on to indicate two or more tanks are filled. Next, tank3 was filled until level indicator controller detects it and water supply was stopped. Thus, water wastage was prevented. The same was also designed and executed on FPGA using Xilinx ISE. FPGA has proven more advantageous for automated multiple water tanks over microcontroller [6].

The water level sensing and controlling system was designed using PIC microcontroller and water level sensor. The water level sensor was designed, the level was detected and was sent to microcontroller which processed the data and further action of pumping was done. In addition, web based water level monitoring was achieved [7].

The water level control system was designed using two different methods one is PID and the other is fuzzy controller in LABVIEW. The main aim was to keep the water level at the desired set point. When comparison was made fuzzy controller yielded better result over PID with no overshoot, low settling and rising time, robustness [8].

The proposed system consists of arduino UNO, ultrasonic sensor, and pump. The water level was sensed by ultrasonic

sensor. There was an interfacing between arduino and LABVIEW. Depending on the sensor reading the arduino switched on, off the pump accordingly and the water was filled to tank and the same was displayed on LABVIEW front panel. When water is not present in the lower tank and if pump is turned on, the pump gets damaged and power is wasted. This is because lower tank doesn't contain ultrasonic sensor, only upper tank contains [9].

The system was developed using arduino, ultrasonic sensor, LCD and relay. Ultrasonic sensor measures the distance, if the distance is 30cm then pump is turned on by arduino and is displayed on LCD and if distance is about 10cm then pump is turned off and is displayed on LCD [10].

The prototype was developed using arduino microcontroller, water level sensor, buzzer and water pump. The water level sensed by the sensor was sent to the controller and the same was transferred to the Bluetooth module where it, in turn sends the information to the registered mobile. In addition, buzzer was used as an indicator. The sensor is of contact type, the measurement range is limited to only 4cm and has short lifespan when exposed to moist environment and having power applied to the probe constantly speeds the rate of corrosion significantly [11].

The prototype was developed using two PIC microcontrollers. One microcontroller was used at the transmitter side and another at the receiver side. The communication between the two was established using zigbee transceivers module. Here the connecting wires were used as water level sensor. The water level was sensed by the conducting strip. The metal strip will become corrosive due to long time usage and accuracy is limited [12].

The prototype was developed using 89S52 microcontroller, ESP8266 Wi-Fi module, float switches. In this, 4 tanks were taken. Float was used as sensing element. The sensed information was sent to ESP8266 Wi-Fi module which will upload the data to server. The microcontroller was used for controlling water level sensors and motor driver circuits. The system makes use of 16 float switches. The float switches are of contact type and can easily get stuck and doesn't move, it has low accuracy, precision and requires frequent maintenance [13].

The capacitive sensors, signal conditioning circuit were designed. The design cost was less. The total capacitance formed was equal to the water level of the tank. The length of the sensor has to be designed according to the depth of the water storage tank [14].

The prototype was developed using arduino microcontroller, water level sensor, mobile phone. The level of water sensed by the water level sensor was sent to the controller where it, in turn updates the information to server. The information stored in the server was sent to the mobile phone. The user in turn makes the decision to turn on or turn off the motor by operating the buttons in the mobile. The sensor is of contact-type. Measurement range is limited and has short lifespan when exposed to moist environment. Human intervention is necessary [15].

The Flow, temperature, conductivity, pH, oxidation reduction potential sensors were designed. The measuring node consisted of microcontroller which processed the sensor reading and was sent to notification node for display via zigbee. Thus water quality monitoring was done [16].

Ultrasonic ranging module HC-SR04 provides non-contact measurement ranging from 2cm-400cm, the ranging accuracy can reach to 3mm and measuring angle is 15 degree [17].

PH, commonly used for water measurements is a measure of acidity and alkalinity, or the caustic and base present in a solution [18].

The Turbidity sensor detects water quality by measuring the levels of turbidity. It uses light to detect suspended particles in water by measuring the light transmittance and scattering rate, which changes with the amount of total suspended solids (TSS) in water. As the TTS increases, the liquid turbidity level increases [19].

III. PROPOSED METHODOLOGY

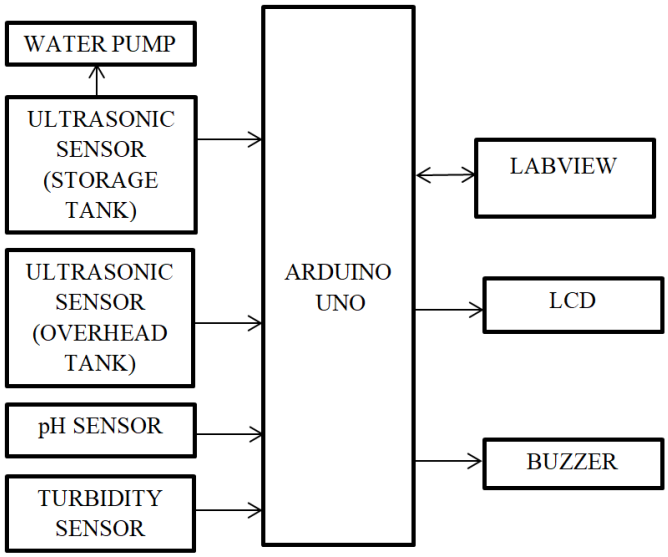

Fig. 1. Block diagram of the proposed system

The block diagram of the proposed system is shown in fig.1. The inputs to the arduino are ultrasonic sensor, pH and turbidity sensor. Interfacing between arduino and LABVIEW will be done. Water level will be detected by ultrasonic sensor. Water quality will be monitored by pH, turbidity sensor. The outputs are buzzer and LCD.

IV. CONCLUSION

Water level and quality is an important aspect in many applications such as chemical industries, household, pharmaceutical industries, nuclear power generation plants etc. This paper concludes literature review of the level and quality of the water using different international conference and journal papers. The proposed methodology can be used for the objective of this paper. If it is achieved helps in saving man power and electricity.

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