

# Water Tank Monitoring System

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**Abstract**— Most of the people in residential areas face the problem of running out of water and overflow of water in water tanks due to excess supply of water. It becomes difficult for users to judge the level of water in water tanks, due to which at times of need users may run out of water. Even when the pump is turned on users will not realize when the water tank is filled which may result in overflow. Water tank monitoring system is used to sort out the issues associated with water tank. It is also possible to check the level of the water using sensor so that whenever the water goes below certain threshold limit, a notification is sent to user through the android application and user needs to turn on the pump. Also when there is overflow of water in water tank it uses sensor to detect the water level so that if the water level goes above certain limit the pump gets turned off automatically. This system prevents wastage of water.

**Keywords**—Water tank, sensors, android application, automatic

## I. INTRODUCTION

Water is a universal solvent which plays an important role in everyday life. The total amount of water available on earth has been estimated at 1.4 billion cubic kilometers, enough to cover the planet with a layer of about 3km. About 95% of the Earth's water is unfit for human consumption. About 4% is locked in the polar ice caps, and the rest 1% constitutes all fresh water found in rivers, streams and lakes which is suitable for our consumption. A study estimated that a person in India consumes an average of 135 liters per day. This consumption would rise by 40% by the year 2025. This signifies the need to preserve our fresh water resources. Many houses make use of supplementary water tank to store water that is collected from rain water or water pumped from well or underground. At present, water meters are used to calculate the amount of water used at homes. This doesn't provide an efficient method of monitoring the water usage. The water is wasted at each and every outlet knowingly or unknowingly which adds up to huge amount in the end. Efficient management of the water used at homes is very much necessary as, about 50% of water supplied to the cities gets wasted through its improper usage. Water management is only possible, if the user is aware of the quantity of water he uses and the quantity available to him.

Hence there is a need for modifying the traditional water meters for the users to continuously monitor their water usage which is always not possible. At present, water meters are used to calculate the amount of water used at homes. This doesn't provide an efficient method of monitoring the water usage.

## II. REVIEWING EXISTING SOLUTION

Konstantinos Loizou, Eftichios Kourtroulis [1], have proposed a sensor which is constructed using multilayer tubes. The cost of manufacturing and associated electronic circuits, which are used for data collection were low. The proposed sensor was developed using polyethylene pipes, which were used for construction of water distribution systems in buildings and industries. The working of this sensor was evaluated in a 4 metre water storage tank. The results of the experiment presented the accuracy of the sensor. However the sensor showed some limitations when it was put to use for long time. L.A. Gama-Moreno, A.Corrado, A.Ramirez-Molina [2], implemented a system to monitor water tanks. The implemented system consisted of instrumentation system, an application, which managed the water levels and a mobile user interface. The system was called as Interface Monitoring Water Tanks (IRMA). Ultrasonic sensor were put into use along with Arduino Microcontroller Board, which is connected to the application service. Notifications are sent when the water level goes below the minimum threshold. The main feature of this system was to control and monitor the watering functions online.

BezaNegashGetu, HussainA.Attia [3], have developed a system which initially tests the availability of water in the tank with the help of a level detector and then adjusts the state of the water pump according to the information collected through the level detector. This design makes use of seven segment display and a motor pump. The proposed system consists of water level sensor and a digital logic processor circuit. The proposed system eliminates manually controlling of water requirements in home and agricultural fields.

Shrenika R M, Swathi Schikmath [4], have designed a non-contact water level monitoring system using LabVIEW and

Arduino. Ultrasonic sensor measures the depth of water in the tank. The program written will receive the data from the sensor and supplies the collected data to Arduino and based on the data received, Arduino board switches the pump ON or OFF. This design overcomes the disadvantages of most of the proposed systems which use SS sensors, which corrode when comes in contact with chemicals present in the water.

PriyenP.Shah, Anjali A.Patil [5], introduced a project which uses Android application and IoT for monitoring of water in tanks. This project uses ESP 8266 as microcontroller. Maximum and minimum levels of water are obtained through ESP from Firebase cloud. When the water level is between Maximum and minimum status can be controlled by the user. This project overcomes the short-comings of conventional tanks which can neither monitor nor control the water level in tank.

Madhurima Santra, Sanjoy Biswas [6], introduced a system which measures water level by using ultrasonic sensors. The system makes use of water level indicator, water level sensor, water pump controlling system and microcontroller. The heart of this system Arduino Uno R3 is supplied by DC SMPS. At first the system receives power supply from SMPS. Ultrasonic sensor gets water level reading and it will send a signal to microcontroller and starts to echo the pulses. The disadvantages of this project is the cost involved in the devices that are used.

Ajinkya Kaner, Milind Rane [7], proposed a circuit based project called Automatic Water level Indicator and controller. This system uses IN4007 diode and Light Emitting Diodes (LED). The results of this project shows three LEDs indicating different level of water in the tank. The main advantage of this project is that, it is very simple in design and it can also be used to find various liquids and oil level in industries and chemical labs too. Some modification in the project will result in a good and efficient designed system.

Amrit Kumar Panigrahi, Chandan Kumar Singh [8], have designed a system which displays information related to water level in the tank and also controls a pump motor. This system makes use of priority encoder which is interfaced with the decoder and displays the information about the water level on 7 segment display. The decoder used is BCD-to-7-segment decoder. The major advantage of this project is that, it reduces the wastage of water by automatically turning off the pump whenever the tank overflows.

EruaJ.Band, Anyasi [9], designed an Automatic Water Level Controller. This design used a Float Switch, which is a device used to detect the level of liquid within a tank. This switch can be used in a pump, an indicator, an alarm or other devices. The advantages of this systems are, it is relatively affordable, durable and efficient, and also it provides ease of operation and high level of reliability. It is also efficient enough in reducing the stress that is associated with manual power water pump controller.

Asaad Ahmed Mohammed Ahmed Eltaieb, Zhang Jian Min[10] implemented Automatic water level control system consisted of arduino to automate the process of water pumping in a tank and has the ability to detect the level of water in a tank, switch on or off the pump accordingly and display the status on an LCD screen. The system also monitoring the level of water in the sump tank (source tank). If the level inside the

sump tank is low, the pump will not be switched ON and this protects the motor from dry running. A beep sound is generated when the level in the sump tank is low or if there is any fault with sensor.

Aanchal M. Pande [11] has proposed a system called Water quality Monitoring system for water tanks of housing society. IOT (Internet Of Things) based water tank monitoring system such as tank water level sensing monitoring and water pollution monitoring has been proposed. The system measures physical and chemical parameters of water quality such as pH, level, turbidity, temperature, and humidity. This parameter detects water contaminants. The measured values from the sensors are processed by ESP8266 Wemos d1 mini and these processed values are transmitted remotely to the raspberry pi via Wi-Fi and makes the raspberry Pi display the data on a simple graphical interface over different time periods.

Sanam Pudasaini, Anuj Pathak, Sukirti Dhakal, Milan Paudel [12] proposed Automatic water level controller with Short Messaging Service (SMS) Notification. SMS Notification was added to automatic controller system so that water can be managed by user during load shedding. Two systems work synergistically; automatic level controller system and SMS system. The program was developed in Aurdino program developing environment and uploaded to the Microcontroller. Water level in the system is controlled automatically. The controller operates on battery power. Whenever the system encounters empty level and the status of load shedding, the SMS notification is sent to the user.

### III. METHODOLOGY

“Water Tank Monitoring System” uses two sensors at two levels of the tank, i.e. one at the higher level of the tank and the other at the lower level of the tank.

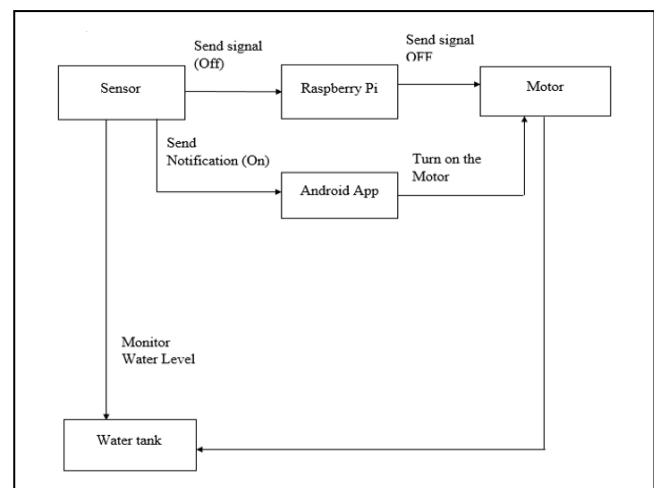


Figure 3.1 : Data Flow Diagram

Figure 3.1 shows the dataflow diagram of water tank monitoring system. The system also uses an Android application which is used by the user.

The proposed system works as follows:

1. When water level reaches the lower level sensor of the tank (empty tank condition), a notification will be sent to the android application that is used by the user. On receiving the notification, user will turn ON the motor through the app. (Manual).
2. When water level reaches the higher level sensor of the tank, the motor will be turned OFF automatically.

Fig 3.2 shows the flow chart for water tank monitoring system. "Water Tank Monitoring System" is introduced to overcome the drawbacks in the existing system. In this system, as soon as the tank becomes empty, pump is automatically turned on. And when the tank is full, pump is automatically turned off. Raspberry Pi can be used to automate the system and to monitor the water level.

Workflow:

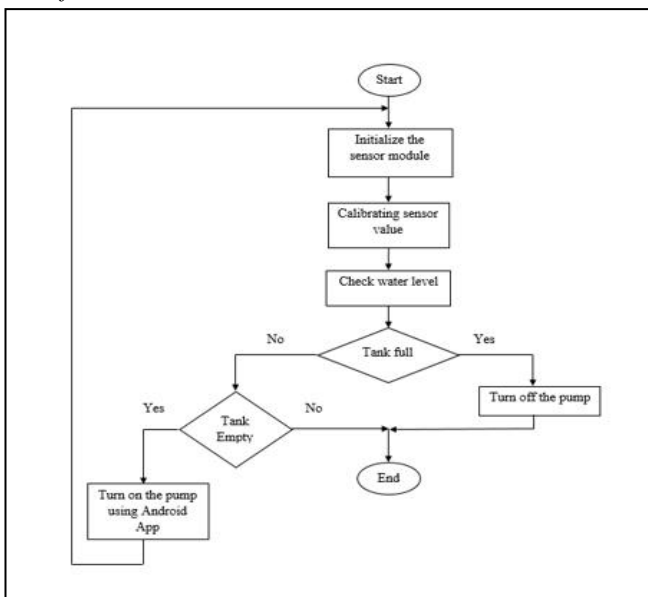


Figure 3.2: Flowchart

So this system creates barrier for wastage of water and provides more financial gain and energy saving. Also it reduces the man power and increases the usage of technology.

#### IV. RESULT AND DISCUSSION

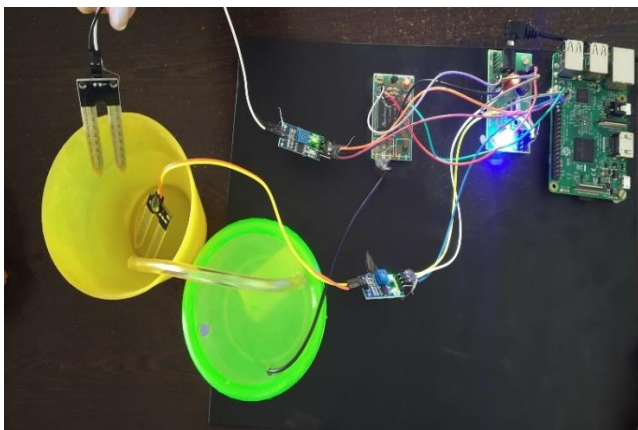


Figure 4.1: Experimental setup

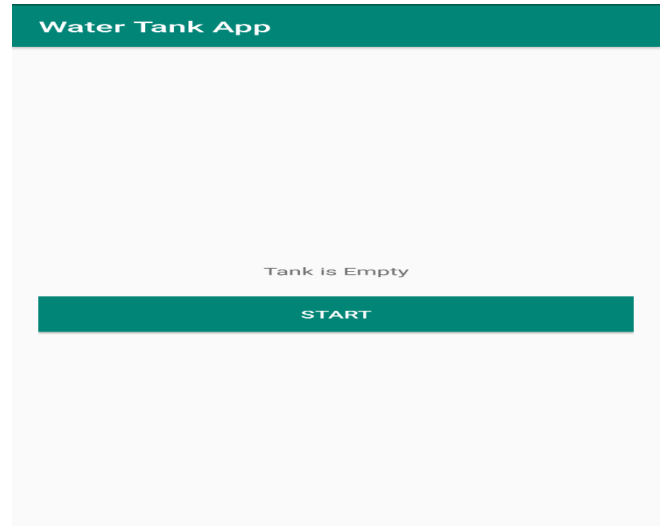


Figure 4.2 Water tank app

The experimental setup is done as shown in figure 4.1 and the app designed to handle the pump when tank is empty is shown in Fig 4.2. And application helps user to monitor all the activities that happen between the tank and the pump.

Features of the proposed solution are:

- i. The automatic turning ON/OFF of the pump using Raspberry Pi.
- ii. Proper management of usage of water and control on wastage of water.

#### V. CONCLUSION

Nowadays water is being wasted in many ways and wastage due to overflowing of tanks is a major contributor for this. Thus, Water Tank Monitoring System helps to reduce the wastage of water due to overflowing by automatically turning off the pump when the water level in the tank reaches a threshold limit. Proposed system can also be enhanced by monitoring the entire activity through an app. An application is developed to help the users turn on the pump through the app and off the pump automatically.

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