

# Water Distribution System

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**Abstract:** During the past years, water needs have increased unpredictably in India. Increasing demand of water system has become a serious challenge for the planet. Wasteful substance of water, climatic changes and Urbanization has further depleted the resource. Conservation and management of the resource must tend utmost importance. In this Journal paper, we present an IoT format for water monitoring and control approach which supports internet-based data collection on real time Environment. The system addresses new challenges within the water sector -flow rate measuring and therefore the need for a study of the availability of water to curb water wastage and encourage its conservation. We also measure the standard of water distributed to each household by deploying pH and conductivity sensors. The traditional water metering systems require periodic human intervention for maintenance making it inconvenient and sometimes least effective. For shortcoming of the prevailing models for a ubiquitous usage of wireless systems for smart quality monitoring and communicate data wirelessly.

**Keywords:** IOT, Wi-fi, Conductivity Sensor.

## I. INTRODUCTION

Water is an important substance for all the livings on the World. In that, some people are not getting sufficient amount of water due to unequal distribution. We can use this approach in order that everyone gets the equal amount of water. It is also wont to avoid the wastage of water during the distribution period. In the previous method, the worker will attend that place and open the valve for a specific duration, but the worker will attend an equivalent place and close the valve, it is waste of time. The proposed system is fully automated. Here human work and time are saved.

To ensure the safe supply of beverage the quality should be seen in real time for the motive of new approach IOT (Internet of Things) based water condition monitoring has been proposed. In this project, we'll implement the planning of IOT base water quality monitoring system that monitors the standard of water in real time. This system consists some sensors which measure the water standard parameter.

The real-time monitoring of water resources information will benefit the water resources management department and therefore the public. The primary concept of real-time IOT based water resources data system is to supply comprehensive and accurate information. The system is developed through defining some explicit water substance parameters then, Water level and flow parameter are defined for water measure & management, followed by a sensor network for water resources information monitoring is made supported IOT. According to recent survey, water has become a big issue because of less rain fall, increase in population many cities are facing this problem people must suffer from this problem, they don't have plenty amount for their daily needs. Due to lack of monitoring water can't be shared properly, some areas in city get water while other some areas can't so, there's a requirement of continuous monitoring, water supply scheduling and proper distribution another problems are excessive consumption, overflow of tanks, leakage in pipeline, interrupted water system. Water may be a basic need of each person everyone 2has got to save the water many an times with lack of monitoring ,overflow of those overhead tanks can occur because of this many water get wasted, another thing due to overflow within the pipelines with more pressure there's possibility of pipeline damage, leakage detection is another problem of these problems are due to lack of monitoring, manual work, less man power, Before implementing this project I even have taken a survey of Aurangabad city and field survey to understand water system distribution and related problems with the system, after taking a survey I observe that each one the work is manual and wish a far better technology to form proper distribution. By that specialize in problems in

traditional methods our system design and develop a coffee cost embedded system device for real time monitoring of water distribution system in Internet of things (IOT) platform.

## II. RELATED WORK

The backbone of the smart water network is that the water division network with electrically actuated valves (butterfly valves) that controls the flow of water to the households, area-wise and streetwise. At the pump side, the system notices all the electrical parameters of the pump and also controls the pump speed (Variable Frequency Drive) taking the inputs from different control valves at every division level. The water level sensors are going to be designed to watch the supply of water within the ground level storage points. The system point out the leaks supported pressure information or with other simpler techniques and informs authority to the position of leak accurately so as that the water gets conserved and also helps the authority to send the labour force to the proper place of leak during at right time. Water standard parameters like, pH, Turbidity and free residual chlorine are monitored and informed to the authority and also the consumers. Other water quality parameters like, temperature, conductivity, dissolved oxygen would even be considered within the system design. The sensors and actuators data at every place within the water network are wirelessly communicated to the central server for the authority to look at and take decisions. Figure below, shows a view of any city-wide water division network.

## III. PROPOSED METHODOLOGY

Before explaining the proposed system allow us to give how water flows into the taps in houses. Cities usually source water from rivers, lakes, and spring water reservoirs. From these water initiate, the water is pumped from pump houses into treatment plants through pipes. The reservoir is the storage for the treated water. Water is pumped from these reservoirs to the overhead tanks spread across the town. The water then gets distributed to houses and factories through a network of pipes performing on gravity. In some cases, the water is directly distributed from the reservoirs to the homes. As all the cities are performing on a sensible city concept, our system specialise in, Internet of things which is new scenario to form city as a sensible city with different application. Main objective to implement this project is to style and develop a coffee cost reliable and efficient technique to form proper water distribution by continuous monitoring and also controlling it from a central server in order that we will solve water related problems. Proposed system consist of a Arduino uno used as minicomputer, different sensors such as water level sensor, flow sensor, and turbidity sensors are used. Arduino collects the data from sensors and send it Arduino uno. This system solves problem of Overflow, over consumption, Quality of water and makes a correct distribution. Continuous monitoring and controlling from a central server is feasible using this technique.

### A. Block Diagram

The ability to observe water level and to protect water from wastage is an important problem through the fields of the domain as well as engineering. Our IOT based system consists of two solenoid valve, Ultrasonic sensor for level measurement, controller, flow sensor and sensors for water standard check like pH, conductivity. The block diagram of the outline system is given in Fig 1.

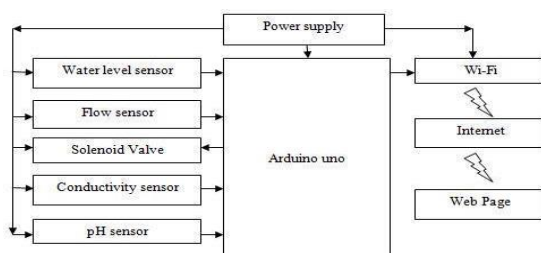


Fig. 1 Block Diagram

### B. Power supply

In this system, we'd like an influence supply of three .3V for Arduino board. Power Supply of 5V for pH, the Water level sensor/ ultrasonic sensor, Water flow sensor and Wi-fi. 12V for water solenoid valve.

### C. Microcontroller

The Arduino Uno is used as a microcontroller in this system, it has 14 digital input/output pins of which we are using 6 pins for connecting sensors-pH, conductivity, ultrasonic, Water flow rate and solenoid valves, and may be used as PWM outputs, a USB connection, an influence jack and a push button is additionally present. We are interfacing Wi-Fi module ESP8266 for giving it an online based approach.



Fig. 2 Arduino Uno

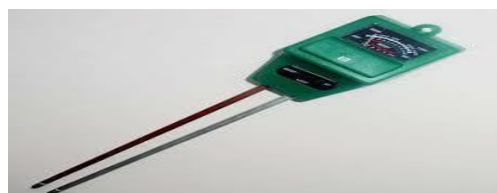


Fig. 3 pH Meter

#### D. pH meter

The pH meter is employed for the standard check if water is safe for drinking. A balanced pH level is extremely important for human health; it should be approximately adequate to 7. We are using ETP306 because it is compact and even are often placed in sunlight. It shows Full range pH reading from 0.1 to 14.00. It gives one reading and continuous reading modes. pH meter is shown in figure 3.

#### E. Conductivity

It measures free chlorine without sample pretreatment. It does not have dirty and expensive testing agent needed. Conductivity data can find contaminants, control the concentration of solutions and control the purity of water. It is Compact in size. Conductivity sensor calculate conductivity by AC voltage applied to nickel electrodes. These electrodes are put in a water sample and reading is acquire. Conductivity sensor is shown in figure 4.



Fig. 4 Conductivity sensor

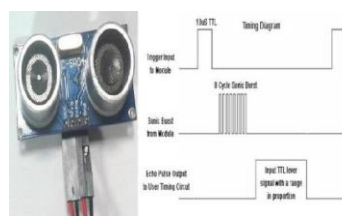


Fig. 5 Ultrasonic sensor & waveform

#### F. Water level sensor

Water level sensor will help us decide if we've enough quantity of water to be supplied. If the tank is empty water flow and a top-quality check are going to be on hold and if the tank is full then, water are often distributed after a top quality check. Ultrasonic sensor HC-SR04 is used to measure distance in the range of 2cm-400cm with an accuracy of 3mm. The ultrasonic sensor module works on the phenomenon of ECHO of sound.

#### G. Water flow sensor

For continues, water flow measurement YF-S201 is employed. Connections required for this flow sensor with reference to Arduino's is extremely minimal. It has operating temperature range of -25°C - 80°C which is wide sufficient for our application to perform successfully. Water flow sensor is shown in figure 6.



Fig. 6 Water flow sensor



Fig. 7 Water controlling valve

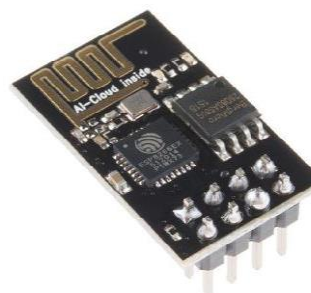


Fig. 8 Wi-Fi module.

#### H. Water controlling valve

A solenoid valve is used as a water managing valve, it is a simple electromagnetic device that converts electrical energy directly into linear mechanical motion. A solenoid valve is the composition of a mechanical valve and basic solenoid. So a solenoid valve has two parts namely-Electrical solenoid and a mechanical valve.

Solenoid converts electricity to energy which operates a mechanical valve that's to open, close or to regulate during a position. The solenoid valve is shown in figure 7.

I. Wi-Fi module

After all the parameters are measured and checked the knowledge has got to be sent online in order that it are often monitored remotely. For this purpose, wifi module is used. It helps us make this system real time. The ESP8266 Wi-Fi Module may be a self-contained SOC with integrated TCP/IP protocol stack which will give any microcontroller access to your Wi-Fi network. The ESP8266 have the ability of either offloading Wi-Fi networking functions from another application processor or hosting an application. Wifi module is shown in figure 8.

J. Working

This system are often implemented on water tanks for safe and waste less consumption. Water is supplied from the reservoir to tanks then the pH level of water will be checked, if it comes in required range than the conductivity of water will be checked. If pH value or conductivity of water value will not be in safe range than the water will not be shared to household tanks and valves will be closed. The Same method will be followed till water does not come in safe range. After the satisfactory quality check of water, if the tanks are full than valves of the tank will be opened and water will be distributed. During giving out of water rate of flow is measured so that equal distribution is done. This whole data is shipped from Wi-Fi to the online page in order that system are often accessed remotely from a computer. The flow of division and standard of water both will be watched from the web page which can be displayed anywhere using the internet. Flow chart of the system is shown in figure 9.

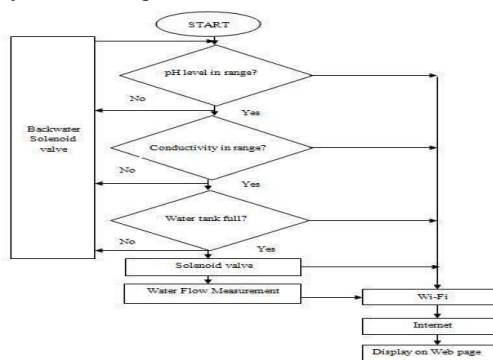


Fig. 9 Flow Chart

Water is one among the foremost important natural resources and water scarcity is that the most challenging issue at a worldwide level. We can use this approach in order that everyone gets the equal amount of water. It is also want to avoid the wastage of water during the distribution period. In the previous method the employee will go that place and open the valve for a particular duration, then again the employee will go to the same place and close the valve, it is wastage of time. The proposed system is fully automated. Here human work and time are saved. The “Prepaid and Postpaid Water Distribution Controller” has been managed to disallow the matter overcome within the existing manual system. This system is planned for the municipal corporations to carry out drinking water operation in smooth and effective manner. In this system the user has two modes of payment. In prepaid mode the user has to pay predefine amount of bill which consist of water consumption limit. After consumption of water the system blocks the supply and notify user for that. After recharging, the system starts water supply again. In post-paid mode, the bill is generated consistent with the quantity of usage of water by user and here also system is capable of blocking of supply if the failure in payment. We will install this Digital Water Management System to each consumer. And these water meters are connected to Internet via Wi-Fi module which will takes the data from those meters and send it to the server. It also consists of Flow Sensor, Solenoid Valve, Microcontroller, GSM module. 2. Current system Fig. 1. Current system Municipal corporation water distribution is performed on manual process and become difficult to watch the use of water at a consumer level. The existing system is fully based on manual system where an employee is sent to take reading from water values.

After that office generate bill for that reading and bill is sent to the customer. This is very long process for collection of wages and due to maximum human interaction, the accuracy level is poor. And there is no proper management system to monitor the customer who does not pay bills but still consumes water from the supply.

There is no pre-intimated or pre-planted water distribution system to stop the wastage of water from any accidental pipe leakage and repairing has been done manually, due to this it is unable to maintain the record of water. Current water tank systems are not able to monitor the level of water in a tank. In current system municipal corporation officer collect the reading and according that it will generate the bill. Municipal Corporation have to invest extra money on billing because it needs human resources and human effort.

#### K. Advantages

- Controls and detect water distribution network from water storage points to consumers
- Water meters would show the amount of water consumed at every household level and helps the command to operate monthly bills - informs user about the standard of water at the source side and also at the in-between allotment points- it also requires, if there are any leaks in the distribution lines and informs authority quickly to take necessary actions promptly
- Measurement of water pressure and level at every storage and division points – Inflow and outflow rate at every storage point
- Modulating type valve that manage the water flow and also refuse overflow from the storage tanks
- Variable Frequency Drives (VFD) to manage the water pump speed based on the pressure caused in the pipeline
- Wireless transmission of data collected from all the sensors and actuators – analytics executed on the data that is received in the data control center and information of the entire water distribution network would be available within the dash board for the water board authority, site engineer and therefore the consumers.

#### IV. EXPERIMENTAL SETUP

A feed for every parameter is made on Adafruit. First it inspect turbidity off water here depict has been done for turbidity if turbidity of water is less than five motor in ground tank will start automatically otherwise motor will remain off. As motor get started it will fill water in both above tanks according to its level of water in tank water is supplied this valves operate automatically flow sensors gives flow rate in ml/sec. If we want to cut provide of any line we can control it from adafruit by composition relay ON/OFF so, controlling is possible from a remote location. If there is no water in any line GSM will load a message also if there is excessive expenditure in any line it will trigger a message that abnormality in line. The system processes within given period of time at adafruit can also operate as continuous process it means proper scheduling is completed for distribution. On adafruit server we will see previous record also data continuously pushed on cloud in order that we will monitor and control it in real time. 16\*2 LCD is used to observe data locally connected to Arduino uno.

#### V. CONCLUSION

This paper will exhibit the successful execution of an internet-based approach to measuring water standard and usage on a real-time basis. A flow sensor for measuring of quantity distributed, eliminating the drawbacks of traditional water metering systems. Future enhancements can include prepaid billing and automatic treatment of water supported the character of contamination. Water metering system are going to be used for automated billing, eliminating the drawbacks of traditional water metering systems. This novel idea are often further extended to other areas like oil and gas monitoring systems.

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