

Digital Water Quality and Quantity Management System

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Abstract: Current Municipal Corporation Water Distribution has manual process need additional personnel and has no system to monitor the flow, utilization and quality of water. According to study, there has a case where one family gets water supply for 1 hr per day and another family gets 24 hours water supply. Each individual has their own usage of water and everyone have to pay amount of water consumption as per their meter reading. And if any person fails to pay water bill then there has no automated system which can restrict the water supply to their houses. To overcome this problem the system has been developed to monitor the flow, utilization and quality of water. The water resources information will benefit to the water resources management department and the public. The “Prepaid and Post-paid Water Distribution Controller” override the problems prevailing in the existing manual process.

Keywords: IOT, Water Quality and Quantity, Water Billing Meter, Automatic Billing.

1. Introduction

Water “Water is a Life” of the living being. When it comes to its proper usage then it will reach us up to the crest but its wastage is very costly for economically as well as by Humanity point of view. Municipal Corporation spends money every year on Filtering and purification of water for the commercial and residential use. In addition, they also spend money on the maintenance and repairing of those traditional analog water meters. The IoT based digital water quality and quantity management system are made to track the usage of water, automatic valve control and flow of water for each and every user by processing the real time utilization of water and billing to the respective user according to its usage. With this system user needs to pay for its usage only, not like a traditional fixed rate Tax. Water distribution and its control over billing cycle is most challenging task for authorized providers. Municipal corporation water distribution is manual process and become difficult to monitor the utilization of water at a consumer level. Existing system limits to monitor the quality and quantity of water. Unpaid bill recovery costing is more than actual bill which waste man hours cost.

We will install this Digital Water Management System to each and every consumer. And these water meters are

connected to Internet via Wi-Fi module which will takes the data from those meter and send it to the server. It also consists of Flow Sensor, Solenoid Valve, Microcontroller, GSM module, TDS Sensor.

2. Related work

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. To overcome this problem author, introduce the integrate system for water distribution, which is going to pre-intimated and prescheduled to the user over the net. And it can also use the mobile app for notification or SMS notification [1]. There is no any system to monitor the quality of drinking water. Author come up with an idea to implement the water quality monitoring system based on IoT. Which is more suitable to monitor the water quality parameters in real time, with the help of wireless sensor network and Zigbee module [2].

“Water pollution is one of the biggest fear for the green globalization.” There is no system for water monitoring. So that author build a system for particular area or zone to monitor water with the help sensors which are connected to Arduino and convert the corresponding sensor reading to digital value and these gathered data will send to the server [3]. While there is a shortage of water in sunny days, some of the Societies will flooding with full of water because of they are situated nearby Corporation so those societies are wasting so much water even if someone doesn’t getting a drop of water. To overcome the situation, the author proposed the totally digital system that can be able to track the usage of each and individual customer’s and generate the Bill according to their used, so that people can aware about water consumption. As Well as if there is any leakage occurs then it can be easily detected to the main server from that they can be able to close the Main Inlet directly from the server to avoid unnecessary wastage of Water and if there is any fault will happen in the system then it can be easily detected to the Main server as well as at the Municipal Corporation website so they can provide the onsite assistance immediately [4].

Current water tank systems are not able to monitor the level of water in a tank. Author introduced a IoT (Internet of Things) based automatic On/Off system to control the level of tank and usage of water. System is turning ON when the water level is lies between low level and high level. Motor is turning Off when it is in between low level and above the high level. User are able to access the data on website [5]. To supply safe of the drinking and useful water for different purposes like agricultural, commercial, industrial etc. so the water should be monitored quality and quantity level. Author developed a low cost system that collected data from the all sensors are used for analysis purpose and for better solution of water problems [7].

3. Proposed system

Water distribution and it's control over billing cycle is most challenging task for government. Municipal Corporation Water Distribution System is manual system and becomes difficult to monitor the consumption of water centrally. If any consumer fails to pay water bill then there is no system which can restrict the water supply to consumers house. Existing system fails to monitor the quantity and quality of water. Unpaid bill recovery costing is more than actual bill which waste man hours cost.

Even now a day's LPG distribution is controlled through pipeline and electric metering system. Reliance comes up with prepaid and remote controllable electric meters. Before floating tender or work for particular project implementation Municipal Corporation execute test run to check the feasibility of the project in terms of physical challenges and funds required. Municipal corporation started a concept test project for water flow control and monitoring system to monitor water quantity and quality.

The system will be an internet-based approach to measuring water quality and usage of water to provide comprehensive and accurate information about water resources on a real-time basis. In the previous method, the employee will go to 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 waste of time. The proposed system is fully automated. Here human work and time are saved. We use this approach so that everyone gets the equal amount of water. It is also used to avoid the wastage of water during the distribution period. Municipal Corporation Water Distribution System will be automated system and become easy and efficient to monitor the consumption of water centrally. Also people will get the information about their water consumption.

Prepaid and Post-paid Water Distribution Controller will monitor the flow and consumption of water by each family. The system will get planted on the water supply pipes of every house. It will monitor and control the flow of water. We get real time data of consumption and can control the valve to restrict flow of water. User can see their usage anytime through dashboard or mobile application. Proposed methodology is to develop a meter which calculate amount of consumption of water which is wirelessly directed to server which store records.

The web portal or mobile application access information from server and display it to customer. Customer can interact with web-based portal or with mobile application to monitor the usage and for payment of bills or to stop or start the service.

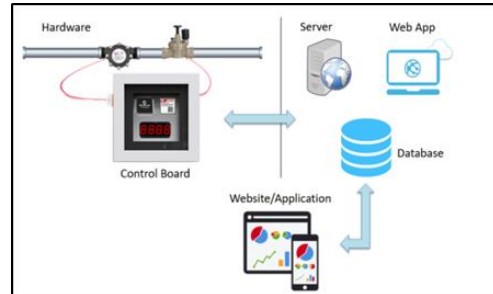


Fig. 1. Water Quality and Quantity System Working Scenario

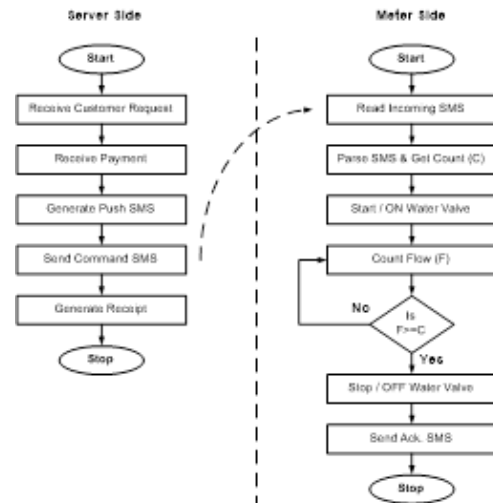


Fig. 2. Water quality and quantity system prepaid flow

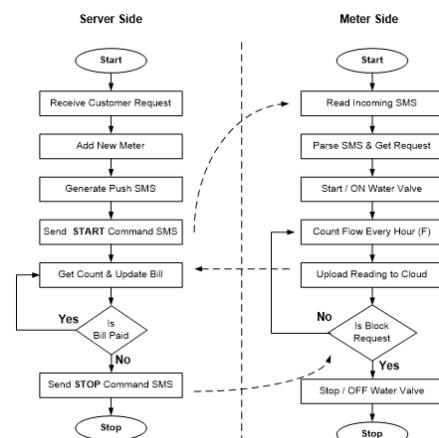


Fig. 3. Water quality and quantity system postpaid flow

Project is divided in three modules, Hardware Module consists of hardware parts like Flow Sensor, Solenoid Valve, Microcontroller for controlling the flow of water. Web Server Module consists of server parts like web server, database, web app to fetch and store the reading of meter.

Website/Application: It consists of application part like website or mobile application to monitor usage of water.

4. Output analysis

Meter having analog and non-electric, physical flow sensor which may give inaccurate result in case of low pressure water supply but in our system we are getting accurate result. It gives accurate water consumption and statistics of usage on time basis. Current system can monitor the flow of water and consumption of water. Customer will pay predefined amount and system send allowed unit details to meter. This data will get stored in flash memory. Now while consuming water system will decrease allowed unit details in flash. As reading gets zero, system notify to server and stops the water supply. In postpaid system will allow user to consume water and at the same time meter will send consumption details to server using GPRS. And, if user fails to pay the billing amount then the water supply will get stopped until amount not get paid. Our system is divided into three module such as hardware, web server and website application. The hardware module consist of Hardware part such as flow sensor, solenoid valve, microcontroller for controlling the flow of water. Web server module contains server part like web server, database, web application to fetch and store the reading of meter. Website Application consists of application part like website or mobile application to monitor usage of water. The flow of water is passing through the pipe from Municipal Corporation to every house in a city. Water enters into the system then TDS sensor identify the quality of water which is suitable for drinking. The solenoid valve permits the water to flow for further process. If the valve is ON the water pass through the sensor and if valve is OFF it stop the flow of water through the system. Flow sensor calculate the flow of the water through the pipe how much water flow through our system and it measure the quantity of water. The quantity of water measured in liter per second. The reading and values are shown on LCD and the flow of water out through the tap. The whole data is store or recorded on our database or server application. We are having android application to see all the reading of water meter. It helps to see the used water and remaining water. We can also control the flow of water which is provided in our house. Bill is generated according to the flow and we are able to see the bill in this system.

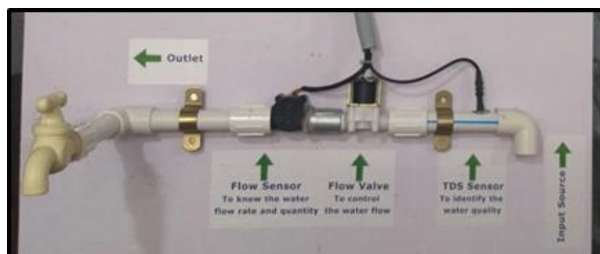


Fig. 4. Working of water quality and quantity system



Graph	
Water Flow Consumption Details	
Date Time: 3/19/2019 10:19:08 AM	Flow Rate: 75
Total Consumption: 1351	Valve Status: 1
TDS Value: 487	
Date Time: 3/19/2019 10:20:38 AM	Flow Rate: 74
Total Consumption: 2779	Valve Status: 1
TDS Value: 487	
Date Time: 3/19/2019 10:22:07 AM	Flow Rate: 73
Total Consumption: 4192	Valve Status: 1
TDS Value: 487	
Date Time: 3/19/2019 10:23:36 AM	Flow Rate: 73
Total Consumption: 5590	Valve Status: 1
TDS Value: 487	

Fig. 5 Water quality and quantity system outcomes

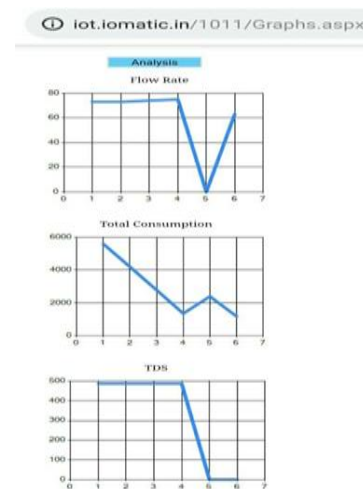


Fig. 6. Water quality and quantity system outcomes

5. Conclusion and future work

This paper will demonstrate the successful implementation of an IoT based approach to measuring water quality and usage on a real-time basis. A flow sensor for measuring the flow of water supplied and consumption, Solenoid valve for automatic valve control, TDS sensor to measure the TDS value of water, eliminating the drawbacks of existing water metering systems. Water metering system will be used for automated Prepaid billing which eliminating the drawbacks of traditional water metering systems. This novel idea can be further extended to other areas like oil and natural gas monitoring systems. This is a test run project which may tested in some 100 consumers for few months to check the project feasibility, we are at the first phase of implementation and we are hoping big success in this project to make the system more convenient and took next step to digital India initiative by government and we are expecting help and support from everyone.

In future, proposed system can be made fully autonomous by embedding the Internet of Things (IoT). With the use of IoT based water distribution system we will include the Turbidity sensor, pH sensor, Water Hardness Sensor, Water Conductivity Sensor and Fluoride Sensor for Quality of water. Detecting the

more parameter for secure purpose. The work can be conducted for different zone of the city deficit/problem in portable water system. On pressure management of 24*7 hrs water supply which reduces the water loses.

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