

# A Review on Water Distribution and Billing System

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**Abstract:** This paper reviews different proposed techniques to overcome the water distribution system. The limitations of the reviewed options are also presented. The present water billing system uses analog water meters. Modern electronic device such as water flow sensor can be used to overcome basic limitations of analog meter such as less accuracy, human error while billing etc. This causes inconvenience to the society members as well as can be regarded as a waste of time. Water is precious available natural resource on the earth. However water is considered as the primary need of human beings. Population growth causes uneven distribution of drinking water in cities and need to monitor and control the consuming of water on minimum requirement base so proposed system improve the water supply monitoring and consuming of water for domestic. The available water billing system is tedious and time consuming process. Error in water billing can occur because of human interference.

**Keywords:** Water flow sensor, analog meter, solenoid valve etc.

## INTRODUCTION

Presently, The current supply of water is continuous, i. e. we can use the water as much as we want. Due to which the wastage is also more. Because of the use is more, till the month of March or April, the water supply to user is less because of the lack of water in the dams etc. The major disadvantages associated with this technology are

- In the present water billing system, water board representative should need to travel to customer premises to read the generate the water bill form analog water meter on monthly basis.
- Present water billing system is tedious and time consuming process. Human interference based water billing can cause faults in billing. This is undesirable error. Automation in the water billing reduces the process time and avoids human errors.
- We can use the water as much as we want. So the wastage is also more.

Water is very important source in the life. some members in a society are working while some are non-working members. The working members being out of the house for most of the time are not able to use water in equal proportion as that of the non-working members. Therefore, comparatively the quantity of water available for them is less. Water when distributed proportionally among the society members will not only save the water but also gets distributed rather used equally and it will save the cost too. This can be done using automation as suggested by us. In urban areas the water supply to residence and commercial establishments are provided at a fixed flow rate. There are incidents of excess water drawing by certain customers/users by using more water per member or by connecting motor-pump sets to the water lines which is considered as water theft. In this paper it is proposed to develop an arduino uno based water monitoring and billing system by recording the flow rates at the consumer/user end.

This paper summarises lots of problems like shortage of water in rural as well as urban areas and various water distribution system available at present along with their advantages & disadvantages.

**PAPER REVIEW**

2.1 Ayob Johari, Mohd Helmy Abd Wahab, Nur Suryani Abdul Latif, M. Erdi Ayob, M. Izwan Ayob, M. Afif Ayob and Mohd Norzali Haji Mohd, “Tank Water Level Monitoring System using GSM Network, presents the development of water level monitoring system with an integration of GSM module to alert the person-in-charge through Short Message Service

“Reference [1]”, introduces water level monitoring and controlling system. In this system water level is not only sensed but also controlled by using PIC 16F84A. For this experiment they have used 8 bit microcontroller, an inverter, a reserve tank, water tank (overhead) and water pump. At the first stage of design a water level sensor is used for sensing water level accurately. Microcontroller is used to control the overall system automatically which reduces the design and control complexity. Microcontroller takes input from sensor unit which senses the water level through inverter. After processing input variables, resultant output decides the water pump action (on/off) with respect to current after status of the tank. They have used audio visual alarms at desired levels and automatic control of pumps based on user’s requirements.

The approach undertaken by the author was quite successful but following limitations has to be considered:

- Limitation 1: This research paper is mainly focused on to monitor the status of of tank but can not control it.
- Limitation 2: There is no any hardware model proposed in this paper, which can be in application.

Based on the study in this paper, a working prototype needs to be designed. The benefits and percent-age acceptance rates of the technology have already been estimated to be far beyond the acceptance level. Hence, the next step will be practical implantation of the concept in working reality.

2.2 Prof. D. B. Madihalli and Prof. S. S. Ittannavar, in “Smart Water Supply Management, it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. [2]

“Reference [2]”, presents indicating and controlling the water level in the overhead tank. In this system the level of the water is displayed through the LED. The copper probes are used to sense the water level. These probes are inserted into the water tank whose level of water is to be monitored. This water level controller cum-alarm circuit by using microcontroller 8085. It continuously monitors the overhead water level and displays it.

Limitation: Proper monitoring with the help of sensors and automation is needed to ensure water sustainability.

As future work for the topic is planned to develop to switch on the pump when water level inside the overhead tank is low and to switch off when the tank is full. In many houses, there is wastage of water due to overflow in overhead tanks. Automatic water level controller can provide a solution to this problem. As water level rises or falls, different circuits in the controller send different signals. These signals are used to switch on or off the motor pump as per requirement.

2.3 Megha M Raykar, Parijata Vinod, Parinita Vinod, Preethi K M, Lovee Jain, “Automated Water Billing with Detection and Control of Water Leakage using Flow Conservation, deals with automatically collecting the water consumption by a customer and also detecting the leakages in the water distribution system. Water leakage is an important component of water losses.

As discussed in this paper, leak detection plays an increasingly important role in water conservation. Thus, adopting water conservation methods and technologies that support water preservation and management is an area of increased priority. By investing in such technologies and systems. The paper describes the design and working of Smart Energy Meter and represents how Smart Energy Meter can be used for Automatic Meter Reading. It is the most economical implementation to develop mankind in this era of technology. Detecting leaks helps saving water resources, cost and energy. More water is available to consumers and can be billed

This paper also shows that how customer can manage the load by using Smart Energy Meter. It provides ease in taking the meter readings, accuracy, and detection of faulty readings. The leakage control can be enhanced by incorporating sensors at the line connecting each and every house to detect the leakage. Provisions can be provided to the customers to send an alert message to the authority in case of any faults or damage occurs to the meter or the pipe can be reported to the utility providers by sending an alert message which will stop the water connection to that particular house.

- Limitation 1: This paper provides brief view on how we can Detection and Control of Water Leakage using Flow Conservation. But does not provide any access to object or billing.

- Limitation 2: There is no any solution provided on how to read localization of billing using GSM. The research carried out in this paper will be helpful in developing a better application by adding personalized searching options feature to the proposed design.

2.4 Ravi Hosamani and Ravi Bagade, in their paper “Arduino Based Water Billing System for Domestic Purpose, has done an arduino development board as central console of embedded system, it reads the sensor to monitor the water usage for houses or domestic purpose. The billing of the water usage will be done automatically and the same will be sent to the user using SMS facility. System gives adequate security support as it uses Short Message Service (SMS) service and also gives an accurate water bill as the entire process will be automatic.[4]

The approach undertaken by the author was quite successful but following limitations has to be considered:

- Limitation 1: This research paper is mainly focused on . The billing of the water usage will be done automatically and the same will be sent to the user using SMS facility.
- Limitation 2: Water level will decrease due to the utilization of water but the motor will still be in off mode state

Based on the study in this paper, a working prototype needs to be designed Hence, the next step will be practical implantation of the concept in working reality.

2.5 Pranita Kulkarni and Mrs. M. S. Joshi, in their paper “An IOT based WaterSupply Monitoring and Controlling System with Theft Identification, in their project, they are focusing on continuous and real time monitoring of water supply in IOT platform.[5]

The main aim is to design and develop an automatic water level controller to maintain the outlet process of the water level at its desired level. It also focuses on the need of people to install automatic water level controller to avoid wastage of water. In this paper we presented the MEGA initiative for defining a reference architecture for water management based on integrating IoT capabilities to achieve a scalable and feasible industrial system. We define the management exploitation layer, coordination layer, subsystems layer and administration layer and the interfaces that enable layer interaction.

Future work will describe the performed test and focus on the contribution to solve coordination problems when executing multiple recipes over the same physical resources, considering priority and conditional executions and also process optimization.

This paper demonstrates the successful implementation of an internet-based approach to monitor water supply and usage on a real time basis.

2.6 Mark Ehab Shoukry, Michael Maher Ibrahim and Maher M. Abdel-Aziz, in their paper, “Electronic Water Billing System, their system consists of smart meters. The machine will take the water readings and send them wirelessly to the water company base station via GSM modules. [6]

This paper has achieved its objectives and provides a system that could monitor the tank water level and report its level via SMS notification using GSM technology. It is developed with a capability to detect low level of the water in the tank and notify GSM modem to send SMS to the intended user hand phone or person in-charge. A series of tests were conducted and found that the system was functioning well. However at times, delay in receiving SMS had occurred and it could be due to detector circuit, the programming of the PIC, and the soldering of the components connection on the prototype PCB.

The following points were noted in this research paper:

- Limitation 1: In this paper I found out that microcontroller they are using does not support I2c protocol
- Limitation 2: Authors didn't specify that how they will access their bill to read and write data.

Apart from this, the system can be modified as per requirement to develop a complete working prototype.

2.7 Ms. Anita V. Patole, Ms Priyanka D. Solshe, Ms Shruti B. Dagade, Kulkarni P.P., “Automatic Proportional Water Distribution in Residential Buildings, in this paper they carried out the work to distribute the water proportionally in each flat using Sensors, Solenoid valve and Arduino kit as main hardware components. Adding to this system GSM module is used for sending message codes to this system in emergency case by the user. This will serve as two way communication between the user and the proposed system.

- Limitation: This system is applicable only for smart phone users. It does not incorporate in LCD display at control station which serves as a better alternative.

2.8 Akhila Satheesan, Pallavi Mane, Sujata Birangal, D.U. Shinde, “Smart water metering system, is used to control the water supply in the house so that the wastage of water will be less. On the basis of analysis and design, the system

provides a smart water meter with eco- friendly and energy efficient system. As the smart water meters are digitized and automated, high accuracy is maintained by decreasing human efforts. A flow sensor based water metering system was used for automated billing, eliminating the drawbacks of traditional water metering systems.

Other aim of this work is the cost minimization for its design and implementation. By using 555 timers, transistors, LEDs, resistors, LDR which is a common and cheap component, this work is implemented without the use of microcontroller, seven segment display, decoder, logic gate and encoder.

Limitation: The fuzzy logic programmed in the microcontroller is applied which controls the level in the tank using drain and feed pumps. Once the set point is reached, the message along with the present level is sent back to the user. This indicates the water level.

2.9 Akhila Satheesan, Pallavi Mane, Sujata Birangal, D.U.Shinde, “Smart water metering system, is used to control the water supply in the house so that the wastage of water will be less.

The municipal corporation measures the estimated water usage for a person. Suppose the estimated value is 50 litre per head, if there are 5 members in a home then the water will reach till 250 litre in a home and the valve will shut off after 250 litre. If the guests are there in home then we should pass the signal to the water distribution center, if they allow then they will pass a return signal and we can get the more water. The water consumption will be according to the use so that the wastage of water is reduced and can prevent the water for future use. [9]

Smart water metering system overcomes all the drawbacks of ordinary water metering. The main advantage of smart water metering system the water will be delivered as per the requirement and can avoid wastage. The system can be manufactured simply and is cheap. Due to the use of zigbee and PIC micro-controller it leads to low power consumption. It is user friendly device. We can view the level of tank and flow of water. This system is built for the water meter, we can also built the smart system for electricity meter and for gas meter. The main goal of our system is to save the energy. The future scope is we can place the sensor to know how much person are presently there in the home and directly give the water according to the person. So the system will be more accurate and cannot send false signal. From the above review of the papers we have decided to contribute all the parameters in one system which gives us fully automated system. In this system we are going to include Water measurement and equal distribution, if any one requires extra water than sanctioned limit he has to send request via SMS, waste if any has to control, billing of the consumed water for the municipal use and to give equal representation to all the building members.

## CONCLUSION

After reviewing the solutions proposed by different researchers. We conclude of a design of water billing system according to usage of water and generates bill accordingly. the present water billing system uses analog water meters. Modern electronic device such as water flow sensor can be used to overcome basic limitations of analog meter such as less accuracy, human error while billing etc. From the case study, it is evident that flow sensor can produce very accurate results. We are going to propose a cost effective and reliable system compared to present water billing system. The process of monitoring water flow rate, transmitting the usage, calculating the bill etc. is through preprogrammed controller and hence it consists of no errors as it avoids human intervention and Billing information is sent through SMS.

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