

SMART WATER METER USING WIRELESS NETWORKING

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Volume based slab system, Tariff based slab system, PIC Microcontroller, Raspberry Pi, Solenoid Valve ,Flow Sensor, GSM Module, IoT, GUI, AT commands, Wireless Communication ,Database, Wi-fi.

Introduction:

The world is facing an environmental crisis unprecedented in human history. This has caused a depletion of fresh water sources. There is an acute shortage of drinking water and unsustainable stress is being imposed on drinking water sources.

In the prevailing political climate, the tariff cannot be linked to the actual cost of water extraction and distribution of water. The tariff is therefore very low. The present water distribution slab system is based on tariff. There is an approximately 40% increase in the tariff as we move to the higher slabs. However, there is no limit on the total volume consumed in the present system. This system has failed because consumers have a high purchasing power. Therefore there is no perceptible reduction in the volume of water consumed and its wastage.

Our project, the Smart Water meter using wireless networking, proposes a new slab system based on total volume to be supplied. Limits are set by the water board (BWSSB). After reaching a predetermined cap water supply is terminated completely for that month automatically. The consumers are given prior warnings through SMS system.

Any fault or meter tampering can be detected automatically. The distribution valve can be remotely controlled by the water supply Board for reset and close. A database consisting of user details, water consumption details is maintained and updated on a monthly basis on the local server which can be used for billing purposes and hence eliminating the need for third person data collection. In the event of power failure the smart water meter does not get reset. In the next phase of the technical development we have also worked on raspberry pi which incorporate the higher end technologies like IoT, Wi-Fi, cloud database and web application.

Objectives:

- Capable of implementing the volume based slab system. After reaching each limit the consumers are informed and cautioned through an SMS and email.
- Detect meter tampering without human intervention. On tampering shut down the valve and inform the user and water Board about the fault type occurred.
- Digitized reading & communicates with the Board of Control using GSM module.
- Board monitors the consumption & regulates it. Automatic bill generation using the

Database.

- More economical for the users. Saved water can be channeled to areas suffering from water scarcity.

Functional block diagram

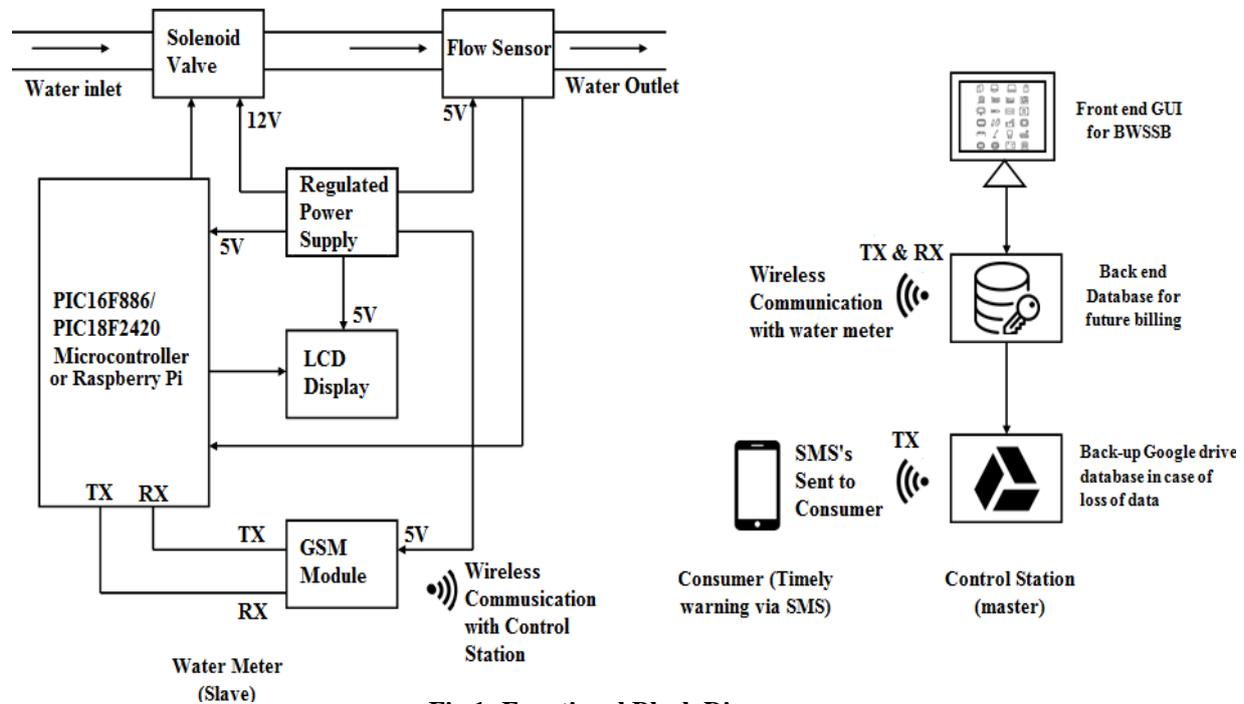


Fig 1: Functional Block Diagram

Methodology to address the problem:

- Consumers are provided with water supply at a subsidized rate below the specified consumption limit.
- After which the consumer is charged at a penal rate up to the next consumption limit. The second consumption limit is the absolute cap.
- Periodic warning message will be sent before they exhaust all the limits. When consumption exceeds the cap, action for complete closure of the valve and termination of water supply for that month is initiated automatically.
- The consumer is kept informed by the water Board through an SMS system using GSM module, programmed using AT commands.
- At the end of each month the meter gets reset for the next month when it receives a reset command from the remotely located water board.
- Implementation of slab system and allotment of specified amount of water for each consumer is done according to predetermined standards.
- The water Board controls the opening and closing of the valve by sending required signals to the water meter.
- Fault diagnosis is better since the water meter monitors the data coming from the flow sensor when the valve is open, which results in less water wastage.

list of components used:

PIC microcontroller (PIC16F886/PIC18F2420) , Water Flow Sensor , Solenoid Valve, G768 Box, GSM Module (SIM800A), Adaptor, RS232 to USB convertor module, DC Power Supply Circuit, Relay Driver Circuit, LCD Display (2 x 16), PICKit 3, 6.1 Raspberry

Pi, Relay Driver (5V)

Conclusions:

The Smart water meter is automatic and does not require much human interference, thereby reducing the errors. To make it tamper proof, the meter shuts off immediately and sends the type of fault to the water Board.

In addition to the above it includes the new system proposed wherein, the slab wise implementation is linked to the volume of water distributed in contrast with the existing system based on tariff.

There are two implementations of the Smart Water Meter; they are using PIC microcontroller and Raspberry Pi. Using PIC microcontroller, water consumption details and limit status are sent to the control station via text messages (SMS) and that data gets uploaded in the local database and is displayed in the frontend (GUI). In the Raspberry Pi implementation, we use Wi-Fi to upload the water consumption details into the cloud. From the cloud it gets uploaded into the database.

The limit based slab system helps in regulating water distribution. This provision is not present in the existing meter.

Future scope of work:

The proposed Smart Water Meter can solve most of the problems faced by the existing meters. Though maximum efficiency of the proposed meter is not attained, there is scope for future up scaling and further improvements.

Instead of installing a single meter per house, provisions can be made to allow separate monitoring of water usage in each sections like kitchen, bathroom etc. It can then individually monitor and regulate the water consumed.

All the additional infrastructures made can be automated further with higher precisions. By knowing the accurate consumption of water in different sections of the same house, it is possible to know if there are any leakages. Leakages or theft if present can be debugged individually, which can be fixed easily.

Added consumer friendly facilities such as online bill payment can be provided by linking the Adhaar number present in the database of the water Board.