REVIEW ARTICLE

GSM BASED PREPAID WATER CONTROL CIRCUIT SYSTEM FOR WATER METER

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ARTICLE INFO	ABSTRACT
	The Prepaid Water meter is a technology for prepaid billing of water along with sufficient monitoring of the water meter readings mechanically from a outside place without any human intervention. This system gives fast and accurate billing of water as well as prevents any abuse of it. In this paper, a technique having adequate security support, for prepaid charges of water using Short Message Service (SMS) has been illustrated. Existing Global System for Mobile communications (GSM) networks have been used for transmitting and receiving SMS. A water meter is used for measuring the volume of water used. This is basically a control mechanism that only allows usage of water only. A valve is designed such that is electrically operated. Valve is used to regulate the water flow for the consumer. A sensing system is also generates an equivalent voltage related to the amount of water used by the consumer.

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INTRODUCTION

The conventional billing system for water meter is that an assigned human visits each house and take the meter readings manually. Then the noted meter readings are used for bill calculation. This manual process can become very tiresome and time consuming. It can cause human error and can open an opportunity for corruption done by the human meter readers and illegal users. Some users disconnect the water supply line from the water meter and collect water directly from the supply line. Because of the absence of automatic monitoring system with the existing water meter, the water supply worker is unable to found the illegal users and this leads to illegal use of water and wastage to a great extent. Thus the billing system can become incorrect. The recent advances in information technology field have made the secured, exchange of information fast and accurate (Islam and Wasi-ur-Rahman, 2009). A water meter that is used to measure the volume of water usage. A prepaid water meter system is control mechanisms that permit water usage when there is a certain amount of prepaid units in the control circuit system and stop water usage when the units are over. However, developed a water meter reading using GSM network that suitable for remote places to monitor the water meter interpret before any

billing process (Mohd Helmy Abd Wahab *et al.*, 2007). In such a system, a customer purchases a separate prepaid credit card with values of credit units store in it. The units are loaded into the control circuit system which permits water usage, when the units are over the control circuit system cuts off water automatically until recharged with new units. They lower the metering costs to a great extent. The municipal corporation will be able to compute its income as the prepaid units are hired. Furthermore there will be no complaints from the consumers concerning overcharge and over dues.

Literature Survey

The current water metering system is postpaid. Water authority sends its workers to customer's locations to read water meter units. The system is time consuming to the corporate workers. The system does not gives the accountability to customers. The watering points in many communities are individually metered standpipes consisting of a mechanical meter and a spigot. Municipality workers visit each meter monthly to record meter readings. Many families in each community share these water points.

As a result, some individuals do not feel the financial responsibility for the water they use and often water is not conserved. Moreover, water can be wasted when standpipes are left moving, an indication of which is the damp soil surrounding the standpipe as shown in Figure 1.

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Flow of the system

First Swipe the RFID card and the Available balance will be displayed on LCD. If the recharge will be less then recharge new amount in card.

Fig. 1. Postpaid Standpipe and Meter

Now enter amount through keypad. If the amount entered in keypad is successful then customer will receive SMS. After receiving an SMS flow meter will be on and water starts flowing through water meter. If required amount of water is utilized then customer will receive SMS and it will give an indication of remaining amount of water. The amount recharged by the customer will be continued or else it will be stopped.
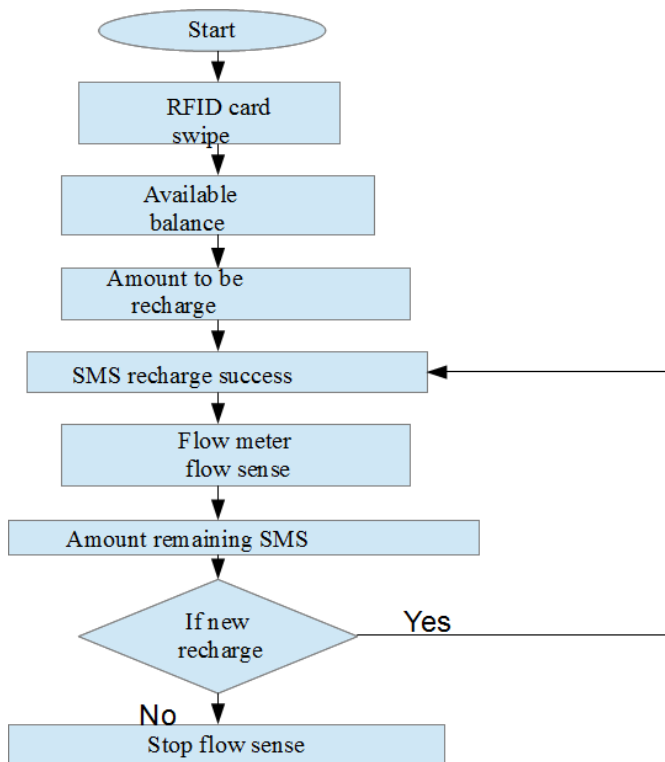

Fig. 2. System flow

System Architecture

The main purpose of this prepaid water control circuit system of water meter is to provide a prepaid mechanism along with adequate monitoring. The Prepaid Unit keeps information about how much water to be supplied. Depending on that information, the Prepaid Unit may disconnect the customer's line and gives no more supply of water to the house. The proposed system consists of RFID Module, GSM module, Solenoid valve circuit, Flow meter, PIC micro-controller, Solar power supply, LCD.
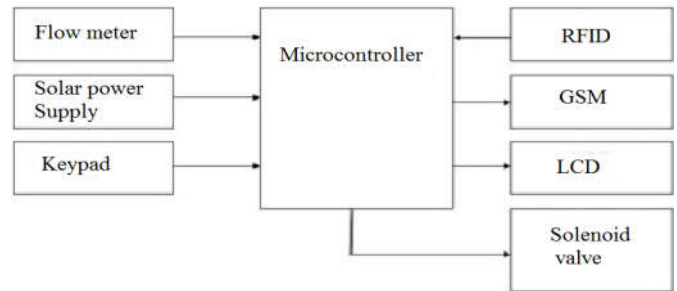

Fig. 3. Block diagram of prepaid water meter

Hardware Description

PIC Micro-controller (PIC18F4550): It is heart of our project. This is used different application such as automatically controlled products, remote controls, printer, office equipment, appliances, toys and other embedded systems. In the early hours models of PIC had read-only memory (ROM) or field programmable EEPROM for program storage, some with provision for erasing memory. All existing models use Flash memory for program storage. Program memory and data memory is separated. Two External Clock modes, up to 48 Mhz. Internal Oscillator Block: 8 user-selectable frequencies, from 31 kHz to 8 MHz. USB V2.0 Compliant. High-Current Sink/Source: 25 mA/25 mA. Three External Interrupts. Four Timer modules (Timer0 to Timer3). 100,000 Erase/Write Cycle Enhanced Flash Program Memory. 1,000,000 Erase/Write Cycle Data EEPROM Memory Flash/Data EEPROM Retention: > 40 years. Self-Programmable under Software Control.
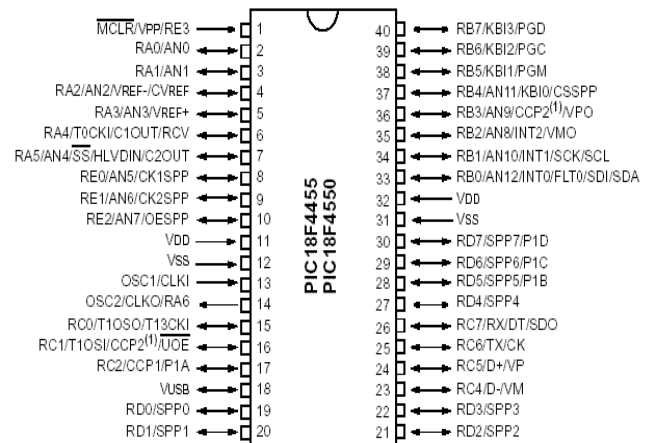

Fig. 4. Pin diagram of PIC18F4550

Solenoid Valve: Most solenoid valves operate on a digital principle. They therefore possess two distinct states, which are (1) when the coil is energies by an electrical current, and (2) when the valve is resting (without electricity). Valve functions are denied from the resting position. The direct acting or pilot operated solenoid valves may have two functions:

Normally closed (NC): A solenoid valve is normally closed (abbreviated - NC) if there is no flow across the valve at rest position (with no current on the solenoid contacts).
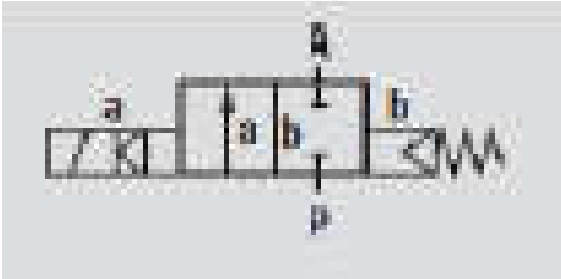

Fig. 5. Normally closed Solenoid Valve

Normally open (NO): A solenoid valve is normally open (abbreviated NO) when it enables fluid to pass in its rest position (with no current on the solenoid contacts).
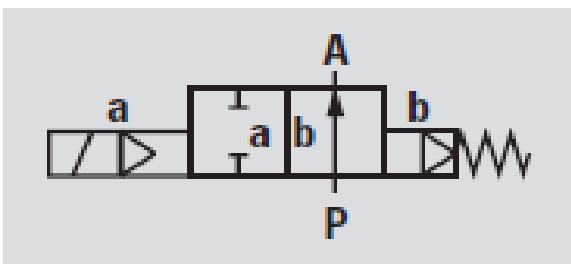

Fig. 6. Normally open Solenoid Valve

GSM: GSM/GPRS RS232 Modem build with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz & 1900 MHz. It is compact in size and easy to use as plug in GSM Modem. The Modem is designed with RS232 Level converter circuitry, which permit you to directly interface PC Serial port. The baud rate can be configurable from 9600 to 115200 through AT command. Initially Modem is in Auto baud mode. This GSM/GPRS RS232 Modem is having internal TCP/IP stack to disable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface.

Flow meter: Water flow sensor consists of a plastic valve body, a water armature, and a hall-effect sensor. When water flows through the armature which is rolls and change the speed with different rate of flow. The hall-effect sensor outputs the corresponding pulse Signal. A flow meter is a device used to measure the flow rate or quantity of a gas or liquid moving through a pipe. Flow measuring applications are very diverse and each situation has its own constraints and engineering requirements.

EM-18 RFID Readers: The EM-18 RFID Reader module operating at 125 kHz is an inexpensive solution for your RFID based application. The Reader comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the reader module to receive pin of your micro-controller. Show your card within the reading distance and the card number is thrown at the output.
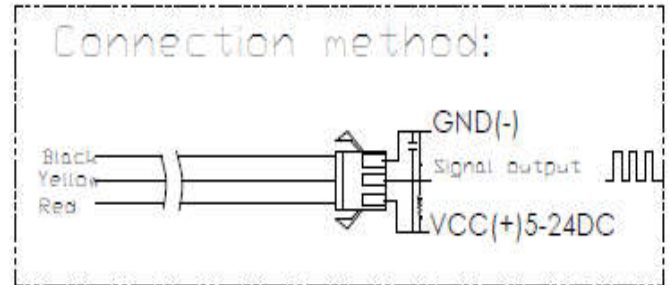

Fig. 7. Connection method of Flow meter

Solar panel: Solar PV modules at the top and solar hot water panels at the bottom mounted on rooftops. Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (in short PV) module is a packaged, joined assembly of typically 610 solar cells. Solar Photovoltaic panels constitute the solar array of a photovoltaic system that create and supplies solar electricity in commercial and residential applications.

Fig. 8. Solar panel

Conclusion

The project attempted to provide a possible explanation for the social factors that triggered the collapse of the post-paid water metering project. It focused on water users attitude and experience, access to free basic water, paying for water and water conservation focus areas were issues of water access, equity and stain ability.

The primary aim of implementing the technology is to raise cost recovery. Prepaid water meters have primarily targeted low-income water users in order to encourage them to pay for water services.

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