Smart Water Meter And Management System

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Abstract:- In our academic project we have brought here an idea of Smart Water Meter, in which the account for the water is made before its usage. In this meter we have used DTMF (Dual Tone Multiple Frequency) technology to recharge the meter with the specific no of units. This units preloaded in meter via DTMF technology will be displayed on LCD screen. On usage of water the no of units will decrement.

The user will have to recharge the no of units required by Her/him by paying to water distribution authorized company. The feedback for the flow of water to microcontroller is given by the flow sensor connected to the flow pipe. The flow sensor works on the principle of Hall-effect. The reading provided by the flow sensor will be processed by the Atmega 328 to decrement the count given by the distributer[1],when certain number of counts are only remaining, a SMS notification to customer will be send, so that the customer can refill the water meter counts in certain perid of time for the continuity of the water supply. The employment of various electrical and electronics components may be helpful the preserve the water on earth as a gift to the mother nature.

Keywords: Bottom Ash, Fly Ash, Concrete, Compressive Strength, Flexural Strength.

I.INTRODUCTION

The process of measuring water use by the consumer is called as water metering. In many developed countries water meters are used to measure the volume of water used by residential and commercial building that are supplied with water by a public water supply system.So Water meters can also be used at the water source, well, or throughout a water system to determine flow through a particular portion of the system. In most of the world water meters measure flow in cubic meters (m^3) or liters (l) on a mechanical or electronic register. Some electronic meter registers can display rate-of-flow in addition to total usage.

There are several types of water meters in common use but as modern need, each and every meter needs to be more accurate and advanced. The various types of them are listed below

1.2 Types of water meter:

- Displacement water meters
- Velocity water meters
- Multi-jet meters
- Turbine meters
- Compound meters
- Electromagnetic meters
- Ultrasonic meters
- Prepaid water meters

1.3 Benefits of water metering:

- Due to the pricing of water consumption made according to volumetric pricing, it provides an incentive for water conservation to the nation**.**
- It also helps inmaintain the water distribution network completely leak less because an estimation of loosed water due to distribution can be made effectively.
- Its installation may be an essential step towards the water preservation on earth and managed water utilization sytem.
- The metering of water volume consumption creates awareness of water conservation.
- The metering of water also allows property owners to keep the cost of rent fair and reasonable.
- Various renovation projects can be develop considering the usage from the water usage data of an particular area.

1.4 Water Management:

Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources.

The water meter which we are developing is helpful to the activity of planning and distributing of water resource. Ideally, water resource management planning has regard to all the competing demands forwater and seeks to allocate water on an equitable basis to satisfy all uses and demands. Water pumping, delivery and waste water treatment facilities consume a significant amount of energy. In some regions of the world over 15% of total electricity consumption is devoted to water management. The implementation of the water meter will be beneficial in reduction in water loss, use of water resource.

II. AIM AND OBJECTIVES

The Smart Water Meter System is a technology for metering water along with sufficient monitoring of the water meter readings automatically from a remote place without any human intervention. The objectives of the system are to conserve water by using the water economically with increased incentives of water bills. The system is based on the principle that the water consumptions are calculated, and consumers are charged accordingly in advance. Consumers spend the amount of water loaded from credit amount by loading the credit to water meters via DTMF technology. The feedback of the meter to customer will be provided by GSMtechnology.

III.BLOCK DIAGRAM AND HARDWARE MATERIAL

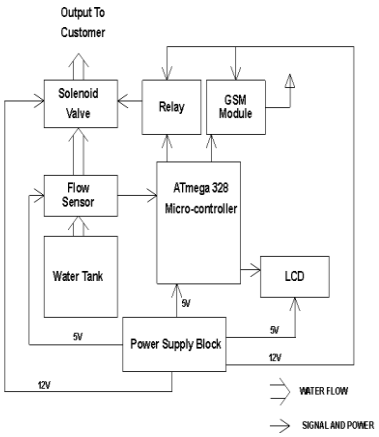

Fig 1 Block Diagram

3.1 Power Supply:

Initially we made the power supply for the system. In this project we needed three different voltage level of supply i.e. 5v, 12v, and 12v so we have used 12-0-12 transformer. The 5v supply is being feed to GSM, Arduino, and LCD. The 12v supply is being feed to relay. The 12v supply is being feed to solenoid valve. The GSM module is used to send SMS. Now the solenoid valve is controlled by the relay and relay is controlled by the Atmega microcontroller via transistor BC547.

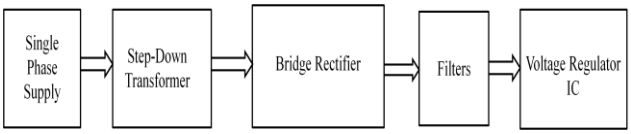

Fig 2 Power Supply Block

The single phase a.c supply is firstly stepped down and then fed to the bridge rectifier.In the project task the components to be used, requires different supply voltages. The various output powers for the application is done using the regulated ICs such as LM7805. The smooth dc output is obtained using capacitor filters.

3.2 Solenoid valve

A solenoid valve is an electromagnetic device used for controlling liquid flow.The solenoid valve is controlled by current flowing through the coil. A magnetic field is created due to electromagnetic effect in the coil, causing a plunger inside the coil to move. Depending on design of the valve ,i.e normally open(NO) or normally closed(NC) type of valve, the plunger will either close or open the valve respectively on applying current to the coil. The control over the flow of the water is to be made using the solenoid valve in the model project.

3.3 Relay:

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit.

3.4 GSM Module:

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. The use of GSM (Global System of Mobile Communications) in the project task is to accept the conformation signal regarding the recharge made by the consumer of the water balance, according to the units of recharge made by the consumer the microcontroller is in to action of letting that particular unit of water to surpass through the solenoid valve. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications[2]. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

IV. HARDWARE DESCRIPTION

4.1 ARDUINO UNO MICROCONTROLLER:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHzceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

4.2 16*2 LCD:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi-segment

LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

V. Literature view

Gas, water, and heat meters measure the volume of gas or liquid that passes through the meter. Automatic meter reading (AMR) and advanced metering infrastructure (AMI) technologies add an additional layer of intelligence to traditional mechanical meters. These technologies improve meterreading efficiency and provide more accurate and timely billing. AMR enables automatic data collection, storage, and one-way communication from the meter to a meter-reading or data-collection device. Such a technology can offer customers and utility companies greater insight into consumption and flow information.

AMI enables two-way communication, bringing even more flexibility to metering systems and networks. The increased communication and control allows for additional features such as remote system upgrades and remote valve control. Why partner with TI Smart Grid Solutions? Choose from the broadest selection of low-power solutions that optimize your gas, water and heat meter systems. TI Smart Grid Solutions deliver:

•Innovation, expertise and support covering all the major functions of the flow meter

•Comprehensive hardware and software port folios to meet specific system requirements

•Solutions that are compliant with standards such as IEC, ANSI, WM Bus and ZigBee[3].

Water is a limited resource and is essential for agriculture, industry and for creatures existence on earth including human beings.Lots of people don't realize the true importance of drinking enough water every day. More water are wasted by many uncontrolled way. This problem is quietly related to poor water allocation, inefficient use, and lack of adequate and integrated water management. Therefore, efficient use and water monitoring are potential constraint for home or office water management system.

Every living thing on earth needs water to survive. Human bodies are made up of more than 60 percent water. We use clean water to drink, grow crops for food, operate factories, and for swimming, surfing, fishing and sailing. Water is vitally important to every aspect of our lives. Monitoring the quality of surface water will help protect our waterways from pollution. Farmers can use the information to help better manage their land and crops. Our local, state and national governments use monitoring information to help control pollution levels.

By using water monitoring system, we avoid the water wastage, power consumption and easily prevent the water for our generation. Water monitoring day was established in 2003 by America's clean water foundation as a global educational outreach program that aims to build public awareness and involvement in protecting water resources around the world. world water monitoring day is celebrated on September 18.

Tank Water Level Monitoring, is used to avoid overflowing and intimate level of water in the tank. Water controlling system implementation makes potential significance in home applications. The existing automated method of level detection is described and that can be used to make a device on/off. Moreover, the common method of level control for home appliance is simply to start the feed pump at a low level and allow it to run until a higher water level is reached in the water tank. This is not properly supported for adequate controlling system. Besides this, liquid level control systems are widely used for monitoring of liquid levels, reservoirs, silos, and dams etc.

Water pollution monitoring can help with water pollution detection, discharge of toxic chemicals and contamination in water. And also check the quality by using Temperature, pH and turbidity are the typical parameters collected in river/lake water pollution/quality monitoring systems. The goal of this project is to design and manage a Wireless Sensor Network (WSN) that helps to monitor the quality of water with the help of information sensed by the sensors immersed in water, so as to keep the water resource within a standard described for domestic usage and to be able to take necessary actions to restore the health of the degraded water body.

Water pipelines leak detection, Pipeline systems are responsible for transporting vital materials such as water, oil and gas. Any leakage in the pipe can cause major financial losses and possible environmental damages. Currently, buried pipelines are only monitored at key points, which can be spaced several kilometers apart. A system with a higher spatial resolution would provide operators with a better understanding of their network. In buried pipeline monitoring, sensor nodes are deployed in soil. The underground environment imposes major limitations on sensor nodes, such as poor RF transmission and lack of maintainability.

Water loss during distribution is considered a major waste. It has been observed that a large amount of water loss happens close to the source of purified water, even before the distribution network. Measurements of per capita water

availability indicate that India is currently water stressed; future projections indicate that India may have water scarcity by year 2050. In this scenario, leakages in the water distribution system can have a huge impact on the water availability. Water flow conservation encompasses the policies, strategies and activities to manage fresh water as a sustainable resource, to protect the water environment, and to meet current and future human demand. It also deals with digitally "noting" the energy meter reading(s). This process eliminates the traditional "paper and pen" and the errors associated with manual reading/recording/processing of the meter data. AMR came into existence since energy meters turned intelligent which dates back to the deployment of microcontrollers in energy meters. Automatic Meter Reading also makes the data recording fast and saves on time and hence complies with the definition of automation.

CONCLUSION

Hereby we have studied interfacing of ATMEGA 328 with various components used in our project. We have learned basics of the Arduino 1.6.5 software along with some basic concepts of c programming. This software's will be used in our project to program the ATMEGA 328. Moreover we have studied the output of flow sensors so as to utilize it in our project. We have implemented the relay circuit successfully. Also we have successfully interfaced LCD display, Relay (using transistor BC547) with ATMEGA 328. We have also successfully implemented DTMF technology and analyzed it output. Thus we have carried out our project work.

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