Smart Water Control System

Mr. Kanaiya Bhatt [1], Mr. Mayur Chavda [2], Mr. Paresh Luhana [3], Mr. Ajay Bosamiya[4], Mr.Sandip Dhoranwala [5]
[1, 2]Assistant Professor ,Dept of Electrical &Electronics
[3, 4, 5]Assistant Professor,Dept of Mechatronics
[1, 2, 3, 4, 5] ITM vocational University, Gujarat, India

Abstract- *in urban areas the water supply to residence and commercial establishments are provided at a fixed flow rate/ there are incidents of excess water drawn by certain users by connecting motor-pump sets to the waterlines which is considered as water theft. In this project 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. In order to implement the proposed water supply system, each consumer should be provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate using a flow sensor and to transmit the same to a remote monitoring station using wireless transmitter and it is also provided with an electrically operated solenoid valve to supply water to the consumers. The valve turns on/off to stop the water supply whenever the flow rate exceeds a predefined limit. The solenoid valves are also controlled using real time clock to control flow of water accordingly for a fixed duration of time. It is proposed to employ a gsm modem for wireless communication so that the information can be passed to particular responsible officer's cell phone for immediate action.*

Keywords- Micro controller, flow sensor, solenoid valve, communication

I. INTRODUCTION

With the continuous economic growth, the water demand of enterprises is also increasing. The monitoring of water resource for these enterprises can prevent the occurrence of stealing water and leaking water effectively. Therefore, the monitoring system of urban water supply has aroused extensive attention in recent years. Urban water supply networks form the link between drinking water supply and drinking water consumers. These large-scale networks are vital for the survival of urban life, for maintaining a healthy level of economic development, and for the continuous operation of factories and hospitals. In world, urban water supply systems are public enterprises, usually part of a local government, and the recent increased interest in privatizing public enterprises has not led to reforms of water systems. Nevertheless, in about 50 cities in the developing world, the water system either has been privatized or franchised to a non-governmental entity for its operation and maintenance.

In existing system, urban water is supplied to the home with the help of some man power. The person in charge will go to the place and then open the valve to that particular area. Once the time is over the person will go again to that place and close the valve. This type of operation needs man power. This is waste of time to go to that place and come back often. Also the people may take excess water for their personal use with the help of motor or some other equipment. Due to this many people will not receive sufficient water for their use.

The water supply systems are part of the urban infrastructure which must assure the continuity of the water distribution, the water quality control and the monitoring and control of the technological process parameters, and deal with the restrictions imposed by the water availability, hydro-logical conditions, the storage capacity of the tanks and water towers and the increasing diversity of water use. In existing system, urban water is supplied to the home with the help of some man power.

The person in charge will go to the place and then open the valve to that particular area. Once the time is over the person will go again to that place and close the valve. This type of operation needs man power. This is waste of time to go to that place and come back often. Also the people may take excess water for their personal use with the help of motor or some other equipment. Due to this many people will not receive sufficient water for their use. Water is the basic needs of the humans. So it should be supplied properly and at right time.

The theft can be prevented only when any public inform the officials about the theft. But the possibility of public is informing to higher officers are rare. So the theft prevention or one who does the theft is difficult to identify i

LITERATURE SURVEY

Authors M.V.N.R. Pavankumar et.al have proposed automation of water distribution and management with technical advances. In the proposed system, the level of water is sensed by a water level sensor. Depending on the level of water, the speed of motor will be varied.

Authors J.P.Shri Tharanya et.al [4] have proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. Here, each consumer end is provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate using a flow sensor and to transmit the same to a remote monitoring station using wireless transmitter and it is also provided with an electrically operated solenoid valve to supply water to the consumers.
Authors Gowtham.R et.al [1] have proposed an improved method of water distribution system by atomization using PLC (programmable Logic Controller) and SCADA (Supervisory Control and Data Acquisition) is explained. And also water theft monitoring is implemented using flow variation sensed by flow sensors mounted on the water pipes. PLC (Programmable Logic Controller) is the central and important part of the system. All the logic functions are carried through PLC, by developing ladder logic program. Sensors and Actuators included in the water distribution network are interfaced to PLCs input and output module. The logic can be easily stored on a disk so that it can be loaded into a PLC .Program logic can be changed according to the requirement of system.

III. METHODOLOGY

The system is provided with an electrically operated solenoid valve to supply water to the consumers. The valve turns on/off by the central processing station PC to supply the water for a particular time period. The system is provided with another electrically operated solenoid valve to stop the water supply whenever the flow rate exceeds a predefined limit. The micro controller will switch ON/OFF the solenoid valve using a transistor as a switch. It is proposed to employ a GSM modem for wireless communication so that the information can be passed to particular responsible officers cell phone for immediate action.

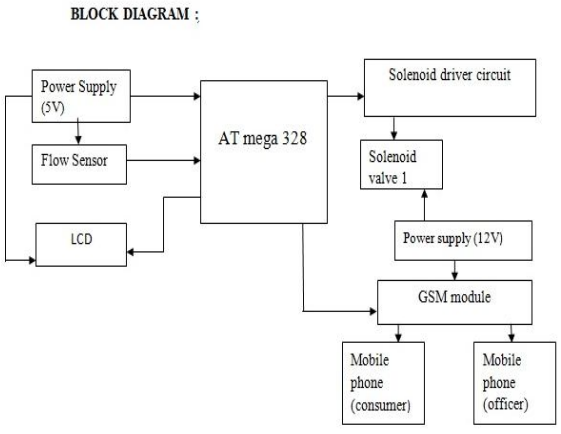

Fig. 1 Block diagram of smart water control system

We have Selected AT mega 328 Micro controller our project. This section will do all operations like measuring water flow, display data on LCD, sending SMS and sending information to GSM. The display will be display the process of MCU unit. GSM used for sending SMS to complainer about his/her stolen vehicle. It will also send SMS to ambulance operator about passing from this location with ambulance identity. A pH meter is a scientific instrument that measures the hydrogen-ion activity in water based solution indicating its acidity or alkalinity of water. Flow sensor measure the flow rates. This device is a part of a flow meter, which will be able to record the flow rate. Solenoid valve that has been selected here is 2/2 way Normally Open (NO) Valve. It enables the water flow in its resting position.

HARDWARE

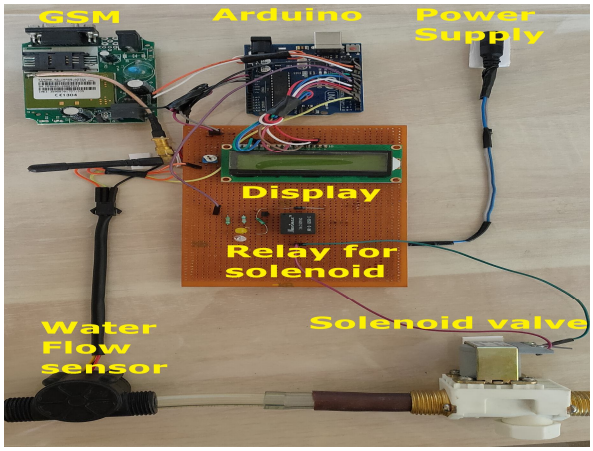

Fig. 2 Final Project Hardware

FLOW SENSOR

In our project work we are using turbine flow sensor to record the flow rates at the consumer end because of its measurement accuracy, cost efficiency. The turbine flow meter translates the mechanical action of the turbine rotating in the liquid flow around an axis into a user-readable rate of flow.

SOLENOID VALVE

The valve that has been selected here is 2/2 way Normally Open (NO) Valve. It enables the water flow in its resting position. It has two ports (one inlet port and one outlet port) and only one orifice seat. A short electrical impulse enables the solenoid valve to be opened or closed. The residual effect of a permanent magnet is sufficient for maintaining the valve in a particular working position with no electrical energy consumption. The opposite polarity of the electrical impulse

will make the valve to retain its original position (i.e.,) to open the valve.

GSM - SIM 300 MODULE

This is a plug and play GSM Modem with a simple to interface serial interface. Use it to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from micro controllers and computers. It uses the highly popular SIM300 module for all its operations. It comes with a standard RS232 interface which can be used to easily interface the modem to micro controllers and computer. The modem consists of all the required external circuitry required to start experimenting with the SIM300 module like the power regulation, external antenna, SIM Holder, etc.

AT MEGA 328

Some of its features are high speed flash memory of 512KB, SRAM of 8KB, 16Mhz clock. The microcontroller is responsible for counting the flow sensor pulses and determine flowrate. When flowrate exceeds predefined limit, the solenoid valve for theft is turned off by the microcontroller. The microcontroller is also programmed to turn on/off supply water control solenoid valve according to the time of the day. At the end of fixed duration of time the microcontroller sends required data to central database via GSM. When theft is identified appropriate message is sent to particular responsible officer's mobile phone.

16×2 LCD DISPLAY

We come across LCD displays everywhere around us. Computers, calculators, television sets, mobile phones, digital watches use some kind of display to display the time. An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

PH SENSOR

A pH meter measures essentially the electro-chemical potential between a known liquid inside the glass electrode (membrane) and an unknown liquid outside. Because the thin glass bulb allows mainly the agile and small hydrogen ions to interact with the glass, the glass electrode measures the electro-chemical potential of hydrogen ions or the potential of hydrogen.

IV. CONCLUSION

water supply monitoring and theft detection system was built. Using proposed system, we can make centralized water control & theft detection system. We can ensure fair water supply to all users by preventing water theft and ensuring by taking necessary action. The disadvantages of the existing system that required man power was eliminated. This real time automation implemented in system avoids of wastage of water and reduce time . Due to database , it is possible to monitor the whole system from central office and produce daily, monthly and yearly reports for quantitative analysis of supply water.

REFERENCES

[1] Gouthaman. J, Bharathwajanprabhu. R &Srikanth. A, "Automated urban drinking water supply control and water theft identification system",Students' Technology Symposium,2011 IEEE,14-16 Jan,pp.87-91,2011.
[2] Stancel, E, Stoian, I,Kovacs, I, &Gyurka, B.Z, "Urban water supply distributed control system", IEEE International Conference on Automation, Quality and Testing, Robotics,2008,Vol.3,pp.316-320,2008.
[3] Mr.PrashantPalkar , Prof. (Dr.) ShrinivasPatil, Prof. Mrs. PoojaBelagali, Mr. AshishChougule, "Automation in drinking water supply distributed system and testing of water",IOSR Journal of Electronics & Communication Engineering (IOSR-JECE),pp.36-38.
[4] J.P.Shritharanyaa, A.jagadeesan ,A.lavanya, "Theft identification and automated water supply system using embedded technology", IJAREEIE, Vol. 2, Issue 8, August 2013.
[5] N.R Kolhare, P.R Thorat,(2013) "An Approach of Flow Measurement In Solar Water Heater UsingTurbine Flow Meter," International Journal of Engineering Research & Technology (IJERT), Vol. 2,pp. 1-4.

BIOGRAPHIES

Mr. Kanaiya G Bhatt
Designation : Assistant Professor
Qualification : Master of Engineering (Digital communication, Gujarat Technological University)
Areas of Interest:Wireless Communication, Embedded System, IOT, Robotics, Arduino, Raspberry Pi.
Email : kanaiyab@itmuniversity.org

Mr. Mayur Chavda
Designation : Assistant Professor
Qualification : Master of Electrical Engineering (Power System, Gujarat Technological University)
Areas of Interest: Power System Protection, Power System, Electrical Machine, PSCAD, MATLAB, ETAP
Email : mayurc@itmvu.in

Mr. Paresh Luhana
Designation : Assistant Professor
Qualification : M.tech. (Electrical Power System), B.E. (Electrical)
Areas of Interest:Control System, Machines, Automation, Power Electronics, Advance process Control, Digital electronics, Plc & Sensor Technology
Email : pareshl@itmvu.in

Mr. Sandip Dhoranwala
Designation : Assistant Professor
Qualification : M.E. (Microprocessor System and its application), B.E. (Electrical)
Areas of Interest: Microcontrollers, Microprocessors, Control Systems, Power Electronics, Digital Image Processing, Electrical Machines, Plc & Sensor Technology.
Email : sandipd@itmvu.in

Mr. Ajay Bosamiya
Designation : Assistant Professor
Qualification : M.E.(Automatic Control & Robotics)
Areas of Interest: Control System, Machines, Artificial Intelligence, Automation, Signal Processing, Power Electronics, Digital Image Processing, Plc & Sensor Technology.
Email : ajayb@itmvu.in