An Embedded Based Monitoring and Distribution System for Water Supply in Urban Areas

S.Gopalakrishnan¹, V.Hemalatha²
Associate Professor¹, PG Student²
Department of ME- Applied Electronics²
Shree Venkateshwara HI-Tech Engineering College, Gobi, India

Abstract:
In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water. The system consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, conductivity, dissolved oxygen of the water can be measured. The measured values from the sensors can be processed by the core controller. This problem of variation in consuming units arises due to water theft and leakage from pipelines. To overcome these issues we proposed a system which consists of flow monitoring system.

Key words: Flow sensor, water management, Solenoid valve, PH sensor.

I. INTRODUCTION

Water is the most basic need for all living beings. Due to continuous economic growth, the water demand of enterprises is also increasing, so the water is needed to be with appreciable quantity. Also in residential areas the water supply should be proper and will be at appropriate time without wasting it. The monitoring of water resource for these areas can prevent the occurrence of stealing water and leaking water effectively. There are some entities which are refer to examine the efficiency of water supplying networks such as availability and storage capacity of water tanks with Continuous supply and controlling technological parameters [1]. Here we are exploring an idea as a solution for the issues such as improper water supply and over consumption by people. Our solution comes with automated supply of water, over consumption alert and usage of various sensors to monitor water flow and to check water level. The system proposed with water distribution unit which is a unit of for distribution to all home units and water theft unit for consuming water [3].

By embedding the details into ARM processor such as time and place to which water have to be supplied the automatically can be done. There are two types of Sensors are used in this idea because they are capable of experiencing even small changes and act properly. The global system mobile infrastructure and information communication technology has grown rapidly in the past few decades and it make the communication reliable for transmitting and receiving information efficient. This fully system is being implemented by 32-bit Arduino Mega 2560 controller. Where, the Arduino Mega 2560 has some advantages, such as running the μC/OS-II embedded operating and low cost and having 2 UART Ports. So it can meet the design's requirements of this system fully. Therefore, in hardware design this system uses Arduino Mega 2560 controller as the main chip.

II. EXISTING SYSTEM

In previous system, water is supplied to the home with the help of some man power. The person will go to the place at a particular time and then open the valve to that particular area. as soon as the time is over the person will go again to that place and close the valve. So the man power is needed in this type of operation. This operation made a waste of time to go to that place and come back often [2]. Also there is no restriction on people regarding water use the people may take excess water for their personal use with the help of motor or some other equipment. This is a reason for that many people will not receive sufficient water. Water is the basic need of the humans so it should be supplied properly and at right time. the theft or any leakage from pipelines can be prevented only when any public inform the officials about the theft. so the one who does the theft is very difficult to identify in the early methods[2].

III. PROPOSED SYSTEM

In this project the disadvantage of existing system are overcome by using certain techniques

A. Water Distribution unit:
The automated supply has been formulated using arm controller to avoid the wastage of water during supply to water distribution unit related areas. The process of supplying water to a particular area at particular time involves in it. The overall distribution process is monitored in PC. Pumping section is connected to ARM. The pump is automatically ON with the help of ARM if the water level is below the set point. Checking the level in storage tank with the level sensor is the first process. The overall system is started when the level attains the set point. When the main solenoid is open, the water is flow through the pump. With the help of pulse output from the flow sensor the flow rate is measured [4]. People can get water until the set point reaches.
The particular solenoid valve is automatically close once the water usage attains the set point.

**B. Water Theft Detection Unit:**

By recording the flow rates at the consumer/user end we develop an embedded based remote water monitoring and theft prevention system. In this unit pulse output is comes from sensor and from this pulse output we easily measure the amount of water passed through the pipe [2]. In order to implement the proposed water supply system, each consumer end is provided with an embedded based water monitoring.

![Figure 1. Pipeline Arrangement](image)

**C. PH Unit:**

This circuit is designed to measure the PH level in the water. The PH electrode is used to measure the PH level. Depending on the PH level in the water it generates the corresponding voltage signal. This voltage signal is in the range of mV so it is amplified by the operational amplifier. In aqueous systems, the hydrogen ion activity is dictated by the dissociation constant of water ($K_w = 1.011 \times 10^{-14} M^2$ at 25 °C) and interactions with other ions in solution. Due to this dissociation constant, a neutral solution (hydrogen ion activity equals hydroxide ion activity) has a pH of approximately 7. Aqueous solutions with pH values lower than 7 are considered acidic, while pH values higher than 7 are considered basic.

**IV. SYSTEM ARCHITECTURE**

![Figure 2. Anti-theft Control System for Drinking Water Supply](image)

In this research work, it is proposed that the usage of Anti-theft control system for drinking water supply. By implementing this proposed system in a real time; surely it will be able to control the drinking water theft in the domestic areas. 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 connecting motor-pump sets to the water lines which is considered as water theft. The proposed system block diagram as shown in the figure below. The flow rate is sensed by the signal conditioning unit when the water is passed through the pipeline. The sensor operates under certain predefined value. When there is a variation in the water flow due to any pumping of water through motor, it will be detected by the water flow sensor. The signal conditioning unit is used to give the desired input signal of the ADC. The Analog signals generated due to variation in the flow of water sensed by the pH sensor are converted into digital signals using Analog to Digital Convertor (ADC) and this digital signal is given to Microcontroller. The Arduino Mega2560 has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega2560 provides four hardware UARTs for TTL (5V) serial communication. An ATmega8U2 on the board channels one of these over USB and provides a virtual com port to software on the computer (Windows machines will need a .inf file, but OSX and Linux machines will recognize the board as a COM port automatically.

![Figure 3. Microcontroller section](image)

The Fig. 4 shows the microcontroller section of the proposed system. It has a controller section, Arduino Mega 2560. In a case if a theft is occurred then the controller will send a signal to the relay switch to close the solenoid valve.

**V. CONCLUSION**

Our device successfully demonstrated a reduction in the amount of water wasted by 60% in a month. It is efficient, easy to operate and cost-effective and can also be used to keep a check on the amount of water leaking from the faucet. Furthermore, the modes in the device can be made to be more activity specific like dedicated modes for brushing, bathing, washing hands, etc. The users would just have to select the activity that they are going to need the water for. If configured with a GSM module, this device can be used to alert the users on their mobile phones and can also send them the data collected. It is efficient, easy to operate and cost effective and can also be used to keep a check on the amount of water leaking from the faucet. Our device can work on any faucet like showers, flushes, sinks and taps and can
even be used in industries where a controlled amount of liquid is required. In the future, this device, if implemented can drastically help in mitigating the global water crises and can help promote sustainable water management in areas of the world where the water is supposed to be used sparingly.

VI. REFERENCES


