Water Management and Leakage Controlling using ATmega16

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Abstract— Civilization is becoming increasingly aware of natural resources; it results in the use of water very carefully. Across India most people use the water in such way most of water gets wasted. It is seen in our day to day life that water requirement is increasing but the water resources are decreasing and the wastage of water is also increasing due to unknown leaks and mismanagement. So to solve this problem we are making use of embedded system that is it ensures Water conservation. A water management is split into different time intervals during which different water flow can be easily monitor and set by user. Whenever require supplying water or stop water supplying or the water flow rate exceeds the set limit, single user can control all these management.

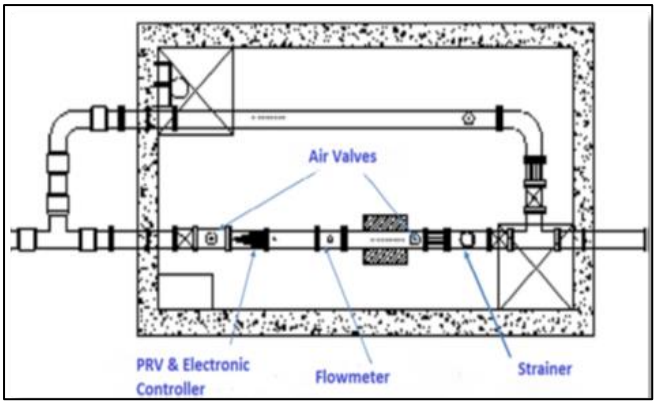
Key words: DMA, WDN, NRW

I. INTRODUCTION

The main aim of the project is to supply water for city in the control of electronic system. Which is centralize and upgraded to internet. Project is to develop a system, which reduces water wastage to a great extent and thereby aiding water conservation. In this we uses powerful micro controller. In our project its work is very efficient that monitors flow from the flow meters, take pre-programmed decisions, control required parameters and maintain all these data on the local database as well as on the controller.

Here for one water flow line 3 flow meters are used as one at start to monitor flow of the starting point and hence control. Second is at middle stage of pipe line for ensuring water is not leakage in transmission at middle level. Third is for measure the wastage water with some tolerance.

II. LITERATURE REVIEW



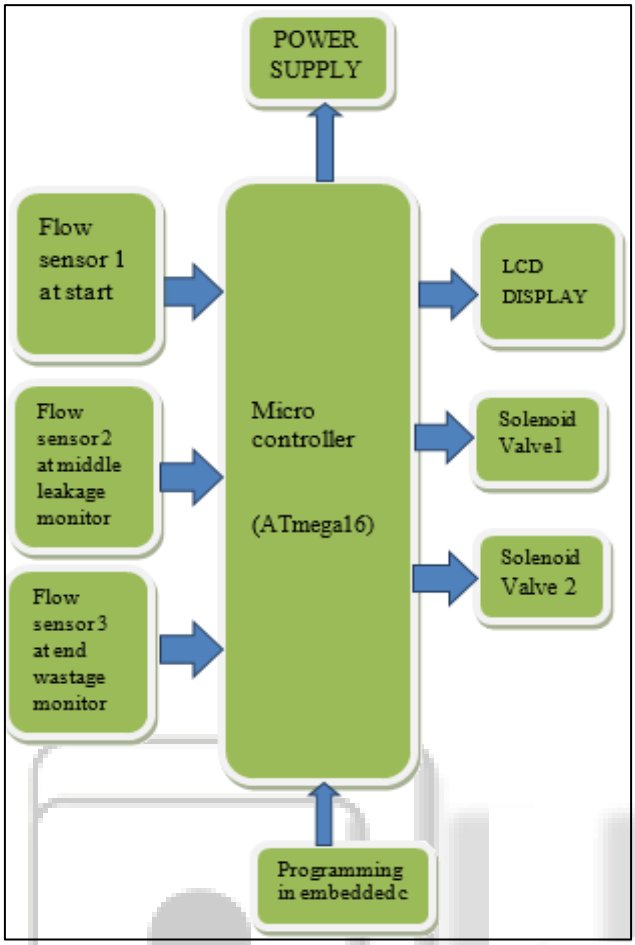
Time-based modulation is applied at the beginning in all DMAs(District Metered Areas). By monitoring and understanding the behavior of isolated DMAs, either flow modulation or closed loop modulation will be applied. In all cases alarms will be sent when a threshold flow or pressure (e.g. fire flow or burst) will be exceeded. It is expected that after the evaluation of the flow and pressure measurements the optimum operational pressures will be applied to the zones, the leakage levels will be reduced and active detection of leakages will be possible. In addition to the flow and pressure monitoring at the inlet point of each DMA and pressure monitoring at critical points of DMAs, additional network data were collected during the implementation of the project with the use of ten portable flow meters (insertion type and ultrasound), forty pressure data loggers, ten flow and pressure data loggers and a ground microphone B.Charalambous B. [1].

Pipe bursts in WDNs are caused by many concurrent factors and are characterized by large water outflows, which results into sudden pressure decrease with respect to normal WDN functioning and might cause severe service disruption and third party damages. Accordingly, WDN management best practices report active leakage control strategies to pursue the fast detection, identification and repair of pipe bursts, besides effective pressure management and asset rehabilitation. Although few alarming strategies have been presented so far for detecting anomalies due to burst occurrence, they have been rarely included into a hydraulically consistent and comprehensive framework for WDN analysis and management Farley M. Trow S. [2].

This methodology has the capacity to find a solution that fully satisfies the management of extreme pressures without introducing significant constraints to the efficiency and performance of the network system. An efficient strategy of control and minimization of pressures is used as a good operational tool for leakage reduction in water supply/distribution systems. Scenarios with different numbers and locations of control valves are analyzed. Pressure and leakage distribution along the network system, as well the operational status of each installed valve allow to compare possible solutions and to estimate the average leakage gain. It was verified that the selection of the best number and location of possible candidate valves depends on the typology and characteristics of the system, which is only obtained by computational sensitivity analysis. Not ever the greater number of valves gives the best solution Alonso, J. M., Fernando,[3].

To evaluate non-revenue water (NRW) and losses in water distribution networks a methodology is developed by applying “annual water balance” and “minimum night flow” analyses. In this approach the main NRW components such as leakage from reported and un-reported bursts and background leakage, with real or estimated data, enabling assessment of indices of leakage performance are evaluated. For better representation of their sults and management of the system, the outputs are exported to a GIS model. Using the capabilities of this GIS model, the network map and attribute data are linked and factors affecting network leakage are identified. In addition, the effects of pressure education are investigated. A. H. Asadiyani Yekta[4].

III. METHODOLOGY



A. Atmega 16 Micro Controller:

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about risc and cisc architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.

ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD. ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals. In our system it is brain of all peripherals to monitor, take decisions and control accordingly.

B. Flow Sensors

The flow sensor monitors liquid media and signals fl ow stoppage or deviation from freely adjustable flow speed. The sensor head is made of sturdy stainless steel and is available in different thread designs. The calorimetric measuring principle with integrated electronics enables easy start-up by means of the teach-in function and reliable condition sensing with maintenance-free operation. A model for the connection of external sensor heads offers an additional temperature monitoring function.

1) Description

Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signal. This one is suitable to detect flow in water dispenser or coffee machine. We have a comprehensive line of water flow sensors in different diameters. Check them out to find the one that meets your need most.

2) Features

- Compact, Easy to Install
- High Sealing Performance
- High Quality Hall Effect Sensor
- RoHS Compliant

3) Specifications

- Mini. Wokring Voltage: DC 4.5V
- Max. Working Current: 15mA (DC 5V)
- Working Voltage: DC 5V~24V
- Flow Rate Range: 1~30L/min
- Load Capacity: ≤10mA (DC 5V)
- Operating Temperature: ≤80℃
- Liquid Temperature: ≤120℃
- Operating Humidity: 35%〜90%RH
- Water Pressure: ≤1.75MPa
- Storage Temperature: -25〜+ 80℃
- Storage Humidity: 25%〜95%RH

C. LCD Display:

LCD (liquid crystal display) screen is an electronic display model 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. A 16X2 LCD means it can display 16 characters per line and there are 2 such lines.

D. ESP8266 Wifi Module

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming this module into an IoT (Internet of Things) solution!

In project used to upload data on local network to show in Visual Basic platform.

IV. RESULT

- Leakage can be easily find out with its nearby location and can be minimize wastage of water due to this by taking immediate action.
- Database of used and wastage of water can be secured using server.
- Reduced operational costs– less travels to the field to repair leaks / bursts.
- More water availed for consumption and therefore increased revenue.
- Reliability of water supply – minimized water supply interruption due to repairs
- Reliable water quality as water cannot get contaminated.
- Good public image for the cooperation.

V. CONCLUSION

The water wastage in various distributions is due to

- Underground broken pipes
- Pure misuse of water
- Negligence of people to solve these problems an intelligent product designed and implemented thereby reducing the water wastage by meeting and scheduling the water supply from the overhead tank.

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