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A LOW COST SENSOR NETWORK FOR REAL-TIME MONITORING AND CONTAMINATION DETECTION IN DRINKING WATER DISTRIBUTION SYSTEM

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Abstract

This paper presents a low cost and holistic approach to the water quality monitoring problem for drinking water distribution systems as well as for consumer sites. Our approach is based on the development of low cost sensor nodes for real time and in-pipe monitoring and assessment of water quality on the fly. Extensive literature and market research are performed to identify low cost sensors that can reliably monitor several parameters, which can be used to infer the water quality. Based on selected parameters, a sensor array is developed along with several micro systems for analog signal conditioning, processing, logging, and remote presentation of data. Finally, algorithms for fusing online multi sensor measurements at local level are developed to assess the water contamination risk, Experimental results indicate that this inexpensive system is capable of detecting these high impact contaminants at fairly low concentrations. The results demonstrate that this system satisfies the online, in-pipe, low deployment-operation cost, and good details to corresponding monitoring unit as SMS, pipe crack detection also we

1. Introduction

This paper proposed one of the best ways to distribute water efficiently using sensor networks. Automatic distribution of water to many areas at a given particular time .In this paper, involved flow sensor to detect theft in home unit ,and using GSM we can send the details to corresponding monitoring unit as SMS. We can detect quality of water using PH sensor, if quality of water becomes low, then it will send SMS using GSM. Automatic tab system involved

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using IR sensor to stop the wastage of water. We can also find out the pipe crack in water distribution system using probe with the

Sensor Networks perform an important role in facilitating efficient management of distributed industrial infrastructure. Sensors are used for monitoring operational status of critical assets with the objective of identifying potential issues early on.

Benefits of such monitoring include the possibility of performing proactive maintenance leading to significant financial savings, and providing regulated industries with efficient means of maintaining and managing distributed infrastructure within regulatory requirements.

Sensors have been used by the water distribution industry in the past for offline monitoring of assets. Recently however they are being increasingly trialed for online monitoring of water distribution infrastructure.

Within this new context sensors are used for collecting information in near real-time for facilitating improved proactive management of pipe systems. Achieving this objective is however highly dependent upon the operational performance of sensor systems in discussion.

Proper design, deployment, and management of sensor systems are therefore critical for achieving the level of efficient and reliable operation necessary.

Acquiring skills and expertise to achieve this can sometimes be expensive and difficult, leading to compromised system design and operation. Non-optimal design choices not only lead to poor performance of the sensor system itself, but also compromise any system which relies on its information.

pipes. Automatic system for distribution of water from main using relay and solenoid valve.

2. Existing system

Existing system have many problems and No one cares about the problems and loss. In existing system water distribution valve will be ON/OFF by manual timing, No one do this in correct timing so there is loss to a particular area peoples.

PH of water and other liquid checked at lab only not in the drinking water distribution system. Water theft can be identified only by the surprise visits, if any damages in underground pipes it is very difficult to detect, we have to check all pipe lines it is very difficult. Automatic tab system only in the malls, resorts.

3. Proposed System

* Water distribution valve can be open/close by automatic system.

* PH value of the water will be checked by remote monitoring.

* Water theft can be easily identified by flow sensor.

* Easy to detect the pipe damages.

* Automatic tab system in the all home unit.

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Using this system we can distribute water efficiently and clear the problem and overcome.

4. Block Diagram

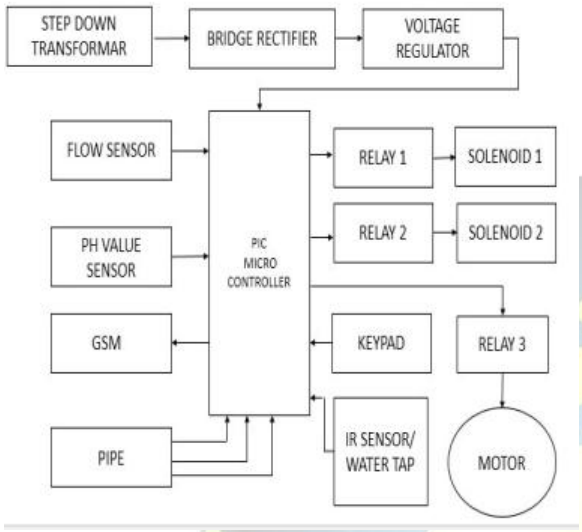

Fig 1 :Block diagram of A low cost sensor network real time monitoring and contamination detection in drinking water distribution system

It consist the pic micro controller,power supply,flow sensor,Ph value sensor,GSM,pipe with probe,relay,solenidvalve,keypad,IR sensor,motor.

opereted valve to distribute water automatically to 2 or 3 areas at accurate time .Flow sensor connected with controller to detect water theft in home unit and alert message will sent using GSM.PH sensor will detect PH value through GSM alert message will sent.IR sensor used in automatic tab system connectd with controller.Using conductivity probe we can achieve pipe crack detection.

A.Flow Sensor

This sensor comes with three wires Red/vcc(5v),Black/ground(0v),Yellow/OUT (pulse output).flow sensor have 3 parts plastic valve body,Water rotor ,hall effect senor.

This sensor sits in line with the water line and contains a pinwheel sensor measure how much water has flow through it.There is an integrated magnetic Hall-effect sensor that outputs an electric pulse with every revolution.By counting the pulses from the output of sensor,we can easily calculate the water flow rate(in litre/hour-l/hr)using a suitable convertion formula

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The power supply consist of stepdown tranformer which transform 230 v into 12 volt AC,bridge rectifier convert 12
DC,votage regulator gives 5v to pic micro contoller.keypad connected to pic micro controller to set solenoid on/off and controll the motor on/off keypad have Relay is electromecahnically operated switch and solenoid valve is electromechanically

B.PH Sensor

It has three components measring electrode,reference electrode,

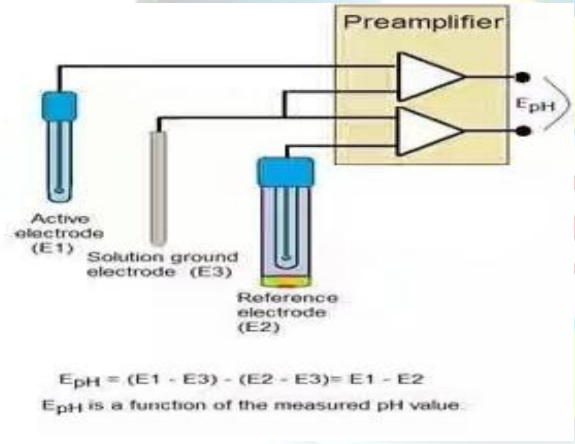

Fig 3: PH Sensor

Measuring electrode potential changes with hydrogen ion concentration,reference electrode potential does not changes and provide stable potential.Potential difference between two electrode is PH of the water.

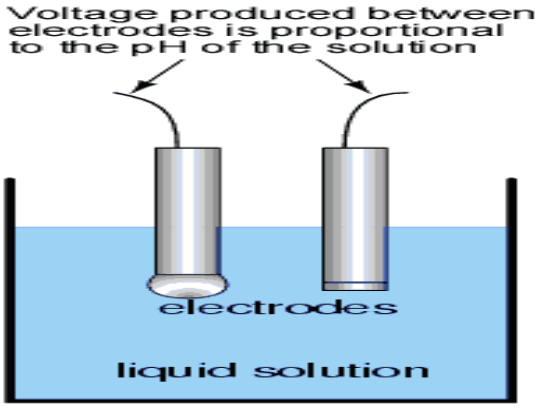

Fig 4: PH Sensor Working

C.IR Sensor

A typical IR sensing circuit is shown in
Fig.5

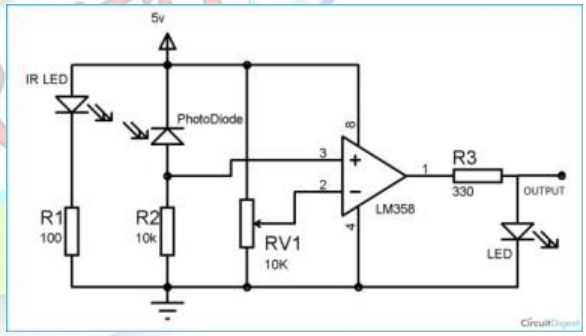

Fig 5: IR Sensor Circuit Diagram

It consist of an IR LED, a photodiode, a potentiometer, an IC Operational amplifier and an LED.

IR LED emits infrared light. The Photodiode detects the infrared light. An IC Op-Amp is used as a voltage comparator. The potentiometer is used to

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calibrate the output of the sensor according to the requirement.

When the light emitted by the IR LED is incident on the Photodiode after hitting an object, the resistance of the photodiode falls down from huge value .One of the input of the Op-Amp is at threshold value set by the potentiometer. The other input to the Op-amp is from the photodiodes series resistor. When the incident radiation is more on the photodiode , the voltage across the series resistor will be high .In the IC , both the threshold voltage and voltage across the series resistor are compared. If the voltage across the resistor series to photodiode is greater than that of the threshold voltage, the output of IC Op-Amp is high .As the output of the IC is connected to an LED, it lightens up. The threshold voltage can be adjusted by adjusting the potentiometer depending on the environmental conditions.

The positioning of the IR LED and The IR Receiver is important factor. When the IR LED is held directly in front of the, this setup is called direct incidence. In this case, almost the entire radiation from the IR LED will fall on IR Receiver. Hence there is a line of sight communication between the infrared transmitter and receiver. If an object falls in this line, it obstructs the radiation from reaching the receiver either by reflecting the radiation or absorbing the radiation.

D. Solenoid valve

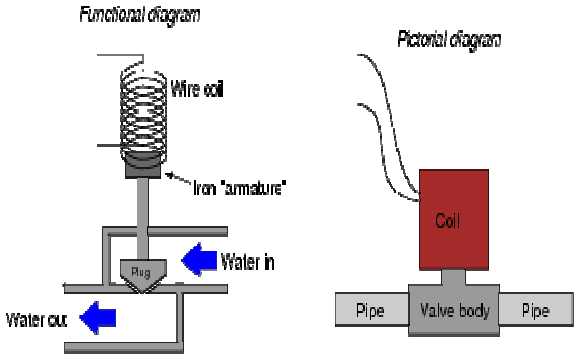

Fig.4. Functional Diagram

When SV is de-energized valve is pulled down by the spring, at that time valve will be off so No water will flow through it.

When a voltage is applied to the electromagnet coil, the current flowing in the coil produces magnetic energy in the iron core which pulls the valve up so water will flow through valve. All this things depends on design like Normally Open/Normally Close, operating voltage, AC/DC, application, etc.

E.Relay

Relay is an electromechanically operated switch.

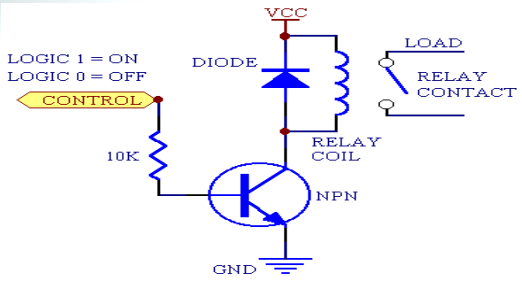

Fig.5. Relay Ciruct Diagram

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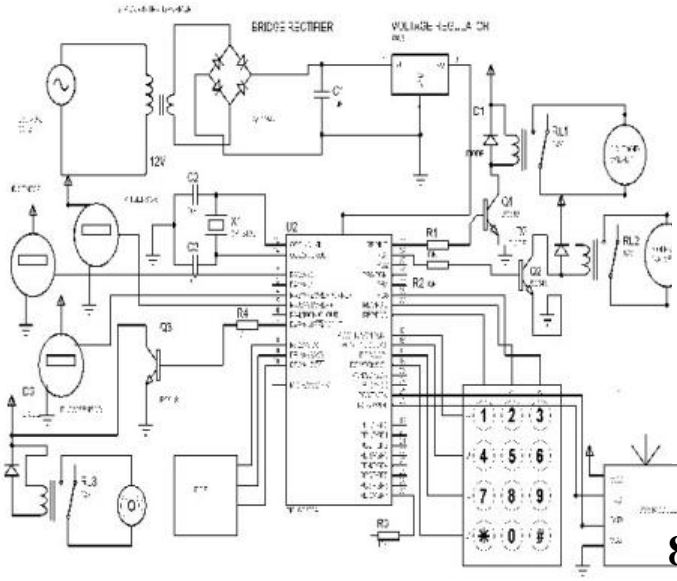
5.Cicuit Diagram



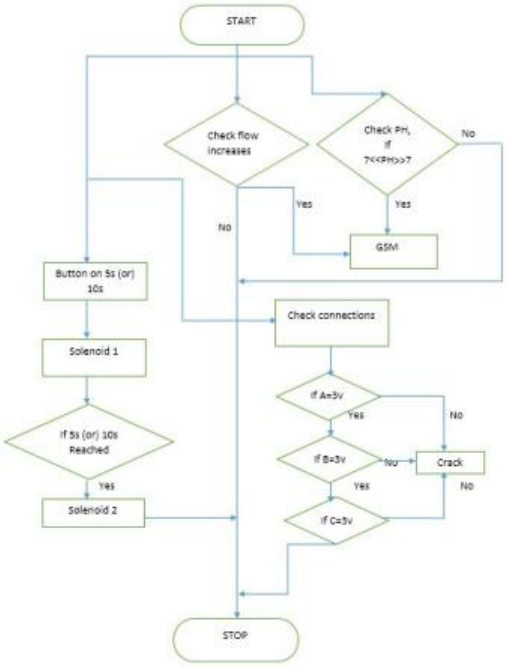


Fig.6 Overall Circuit diagram

Pic Microcotroller has 40 pins,there is 33 i/o pins,1 reset,2 ground and 2 power supply pins.The sensors connected between
2 to 8 pins of port A ,gives an analog input signal to the controller.The crystal oscillator connected 13,14 pins of controller and DC Motor connected to 7th pin port A.Pipe with three probes connected to 8,9,10 port E.Relay connected to 33,34 pins at port B solenoid valve connected to relay.GSM connected to the RC/6 and RC/7 pins port C.

7.Flow Chart

8.Conclusion and Future Work

This paper addresses about developing an efficient wireless sensor network based on water quality monitoring system , and the sensor network to detect water theft in home units and sensor to detect water purity,pipe connection with probe to detect pipe crack, automatically distributes the water from main.In future work we plan to develop this system to easy and efficient.

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