

Design & Implementation of Water Quality Monitoring & Notification System

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Abstract: Drinking water is the most valuable thing for all the human beings. Drinking water faces new challenges every day. The contamination of water becomes a major problem globally. The water quality monitoring by conventional method is very time consuming which involves collecting water samples from different places and then tested it in laboratory. This is not an efficient method. The need for effective and efficient monitoring, evaluation and control of water quality in residential area has become more demanding in because of urbanization, population growth and pollution. providing safe water supply of drinking water is big challenge for modern civilization. This challenge occurred because of limited water resources, growing population and infrastructure etc. Hence requiring the fastest and better method of water monitoring system which gives results within the minutes. In order to ensure the safe supply of drinking water quality, this paper gives an introduction of such a faster system which named as water quality monitoring and notification system. For water quality monitoring there are various sensors are used such as temperature, turbidity and PH.

Keywords: Microcontroller, sensors, water quality monitoring, GSM Module.

1. Introduction: In the developing countries because of improper water quality monitoring technologies, the dirty & polluted water is used for drinking purpose. The lack of water quality measuring systems causes lots of health problems to the human beings. Water pollution is one of the serious problems at this time in the world. Drinking the polluted water affects health of human beings. Water is essential natural resource of life for humans, living organism on the earth. In examining quality of water parameters like pH level, turbidity is necessary to check. Health issues of human, plant and other living organisms on the earth depend on water quality. The different water sources like rain, rivers and lakes are available on the earth. Rain water running over the lands contains many useful as well as harmful contents and may be soluble or insoluble. A salt and other essential or harmful particle in

soil decides the acidity of water. Traditional methods fail to remove insoluble particles present in water causes limitations on the use of water for particular applications. The main ambition of this system is to measure pH level, temperature and turbidity of drinking water as well as water that may be used for domestic, agriculture and industrial process. This system measures parameters of water quality by using sensors providing quality control and gives the notification on users mobile through GSM module. The parameters that are monitored and control to improve water qualities are turbidity, temperature and pH level of water.

2. Hardware:

The hardware used in this system are given as follows.

- Turbidity Sensor
- Temperature sensor
- PH sensor
- Ultrasonic sensor
- Arduino Mega Board
- GSM shield module
- LCD display

The components used in this system are explained as follows:

Turbidity Sensor:

Turbidity is the darkness or cloudiness of water because of a large number of micro particles are present in water that are invisible to the eyes, like smoke in air. Turbidity is the method measuring quality of water. . Muddiness of water is measured with the help of turbidity sensor. If turbidity is lower than the water is clear. Muddiness is the Total suspended solids in water. If it increases, the water's turbidity level also increases. For monitoring the turbidity level of water, turbidity sensor is preferred. The sensor uses light to detect suspended particles in water by balancing the light transmittance.

Temperature sensor:

Temperature sensor is connected to the ARDUINO mega board which is used for the measurement of temperature of water. The data provided by temperature sensor is analysed by ARDUINO board and then it will send on mobile through GSM module.

PH sensor:

A pH sensor is used to measures the PH level (hydrogen-ion concentration) of water, indicating its acidity or alkalinity. The pH of pure water is 7. In general, if water with a pH lower than 7 is considered as acidic and with a pH greater than 7 is considered as basic. The high accuracy pH probe TL42 is used as a pH sensor which is a special glass refillable electrode.

Ultrasonic sensor:

This sensor measure distance by using ultrasonic waves. The sensor transmits an ultrasonic wave and receives the wave reflected back from the target. The main purpose of using Ultrasonic sensor for observation of water level in water tank means the water tank is empty or fully filled.

Arduino Mega Board:

The Arduino Mega is a microcontroller board based on the ATmega2560. The Arduino Mega is powered with the USB connection or an external power supply. Temperature, ultrasonic, PH and Turbidity sensors are connected to the ARDUINO board. These sensors send the data to ARDUINO board which is connected to GSM module for sending this data to mobile as sms. The LCD screen display is also connected to the ARDUINO board for displaying the output of sensors.

GSM shield module:

SIM900A GSM Module is used in this project for sending and receiving the messages. SIM 900 means the module supports communication in 900MHz band. This GSM module requires a 12 volts input and it has DC Jack for connecting adaptor to the module. This GSM module requires a SIM card for sending information or data as SMS to mobile. This module is connected with ARDUINO.

LCD Display:

A 16x2 LCD display is used for showing the information sense by sensor. Here 16x2 means it can display 16 characters per line and there are 2 such lines. It is connected to the ARDUINO board. The data sense by sensor is analysed by ARDUINO and then the data as an output will be displayed on LCD display.

Block diagram:

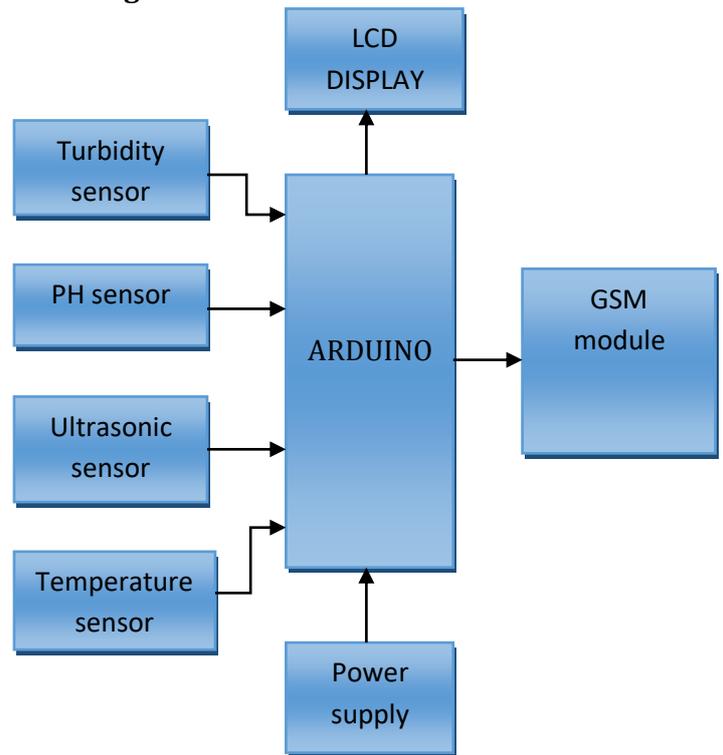


Fig.1. Block Diagram showing connections of all components.



Fig.2. prototype of water quality monitoring & notification system.

Working:

The system is introducing for monitoring the water quality by different sensors such as turbidity, pH, and temperature. The microcontroller accesses the information which is monitored by the use of sensors. The accessed data are controlled by the use of Arduino microcontroller.

This project included the GSM module for communication, sensors, and Microcontroller. The parameters to be measured in the water quality monitoring system such as the pH level, turbidity and temperature is measured by the sensors that send the data to the Arduino mega board. The monitoring of the water quality is a complex process as it has several laboratory testing methods which are time consuming. To overcome this difficulty, monitoring of water goodness by water quality monitoring system has been proposed. Four water samples from different water sources were tested to establish a reference on the parameters for each water type. The selected water types are surface water, underground water, Tap water and polluted creek water. The water quality data is read through the water quality testing sensors and sent to microcontroller. The data is then analyzed by the microcontroller and the result as an output is displayed on the LCD screen. One more copy of the sensor readings is sent by the SIM 900A GSM shield module to the water quality monitoring user's mobile phone in the form of SMS. When an abnormal water quality parameter is detected by any sensor and sent to Arduino mega board to analyze the water quality is normal or not. If the output is unexpected, Arduino will turn on the respective red LED for that parameter which will give warning. At the same time, the Arduino will give results to GSM module and it will send the water parameter as a report to the user as SMS. The system has been designed so that it can be used for detection of temperature, turbidity, PH level and use by all kinds of users.

Result: The water quality monitoring system is designed and is working as per requirements. To determine the quality of water parameters, the pH, Turbidity and Temperature sensors are inserted into the container which is filled with water. The level of the water is checked by Ultrasonic sensor which is mounted on the system. The data is then analyzed by the microcontroller and the result as an output is displayed on the LCD screen. At the same time, the Arduino will give results to GSM module and it will send the water parameter as a report to the user as SMS. The system has been designed so that it can be used for detection of temperature, turbidity, PH level and use by all kinds of users.

Photos of LCD SCREEN display:

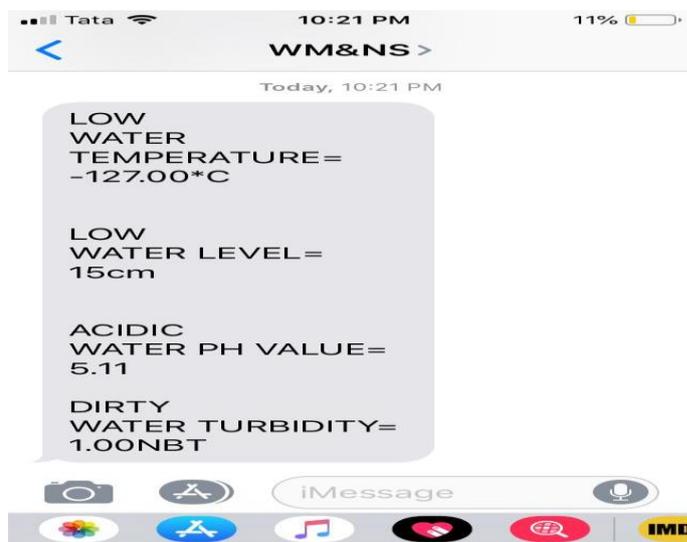


Fig.3. Notification on mobile through GSM module.

Conclusion: The system can monitor water quality automatically, triggers alarms immediately to prevent any health hazards and it is low in cost and does not require people on duty. This water quality monitoring system is likely to be more convenient and precise. The microcontroller, GSM Shield module, LCD screen display and other components are used to achieve the objectives of the proposed design with acceptable accuracy. The diseases that are caused due to the presence of metals and pollutants in the water can be avoid by this system.

Reference:

[1] Sridharan, S. Water Quality Monitoring System Using Wireless Sensor Network. International Journal of Electronic Communications Engineering Advanced Research, 3,399-402 (2014)
 [2]Gouthaman.J, BharathwajanPrabhu. R &Srikanth.A "Automated urban drinking water supply control and water theft identification system" Proceeding of the 2011 IEEE Students' Technology Symposium, IIT Kharagpur pp.87-91, 2011.
 [3]Amruta Amit Joshi, "Water Quality Monitoring System Using Zig-Bee and Solar Power Supply" (IJAREIE), Vol. 4, Issue 10, October 2015
 [4]Pandian D R, Dr. Mala K, "Smart Device to monitor water quality to avoid pollution in IoT environment", (IJTCSE), Volume 12, Issue 2-January 2015.