

# Borewell Water Quality And Motor Monitoring System Using Internet of Things

Supriya S Rao<sup>1</sup>, Prathiksha Kamath<sup>2</sup>, Priyanka Sharma<sup>3</sup>, Vijayalakshmi V<sup>4</sup>

<sup>1, 2, 3, 4</sup>Dept of Information Science and Engineering

<sup>1, 2, 3, 4</sup>Atria Institute of Technology, Bengaluru, Karnataka, India

**Abstract-** India is an agrarian country and farmers depend on groundwater. Due to the irregular distribution of rainfall and failure of monsoon, it led to forcefully drilling of borewell to greater depths. Since there is no alternative, the people in Urban areas depend on borewell water. Furthermore, water pollution has been an increased problem over the last few years. To overcome disadvantages like poor quality drinking water, increased manpower requirements, irreversible damage caused to poorly monitored public motors, technology advancements like Big Data, Internet of Things, Cloud Computing and Internet facility can be used to monitor the borewells. Borewells are a vital source for the people. To implement this project, the system would use two sensors namely turbidity and pH sensor to check water quality while the motor monitoring would be done by the temperature and current sensor. We also make use of an Arduino board for finding pH value and GSM module for message technique. Single microcontroller Wi-Fi chip is used to send the data to various borewell to a single server. By achieving this system, we can monitor multiple borewells in a township remotely in a single chip.

**Keywords-** Arduino UNO, Current and Temperature sensor, IOT, Node MCU, pH Sensor, Turbidity Sensor.

## I. INTRODUCTION

Internet of things (IoT) Gateway is responsible for performing several critical functions which are from translating protocols to encrypting, processing, managing data and also filtering data. The gateway software which is being the heart of IoT collects the messages from the sensors and stores data appropriately until they can be pre-processed. Furthermore, this data is sent and the decision is made based on the stage of processing whether it is temporary, persistent or kept in memory. The system implements a network of water motor.

In the conventional method of water quality testing, samples are collected from the source of water and then the samples are sent for testing and analysing the quality of water to the laboratory. But it requires a lot of manpower, space and money and it is a time-consuming process. The new

monitoring system based on IoT Gateway will overcome all the limitations.

The usage of Ph, turbidity of water, motor temperature and current drawn by the motor will be detected continuously the whole day. The data from the sensors is obtained by the microcontroller chip which not only detects the values of the water and motor parameters but also processes and analyses them and these values are sent through the IoT Gateway. In case of abnormality in the water and motor parameters compared to threshold, which is set through the code, the information is sent to the mobile application which would indicate an alert to the person who has the application installed. Thus, by this mechanism, timely measures are taken, and detection of real time situation of water quality is done.

## II. LITERATURE SURVEY

The data related to the water parameters will be collected in a single chip and it will be processed and analysed. Through GSM network the data will be sent to monitoring centre by the means of SMS.

It leads to the implementation of FPGA based water IoT monitoring system. For real time monitoring of the water quality the low-cost system will be designed and developed. To measure the physical and chemical parameters of water different sensors will be used by the system. Temperature, pH, Turbidity and other such water parameters can be measured. The core controller will process the measured values sensed by the sensors. The Arduino model will act as the core controller. By using WI-FI system the sensor information can be seen on internet.

Voltage, current, speed, and temperature are the motor parameters which are monitored by GSM module. If there occurs any problem in the system, it can be viewed on mobile screen through the SMS sent by the GSM module.

Wireless connection for industrial motors will be developed to detect the mechanical fault. Wireless sensor network is a sensor network used to analyse the motor current

and temperature. Through graphical user interface (GUI) real time monitoring of several parameters can be made.

For monitoring both water and motor there is no combined system. This project will provide a new concept on real time public borewell monitoring system by referring the above works.

### III. PROPOSED SYSTEM

#### Functional Requirements

- Arduino UNO
- pH Sensor
- Turbidity Sensor
- IR Sensor
- Current Sensor
- Voltage Sensor
- Pump
- Rivet
- Motor
- Controller Plate

IoT based Smart Well Monitoring System is used to implement the project. The hardware part of the project consists of sensors, which will sense the pH level of the water, turbidity, water level in the well and other such parameters. All the sensors in the system will be interfaced on the microcontroller. Cloud is used as the storage medium where all the informations will be stored. The project involves building an android application for the villagers, which will show all the statistics and parameter detected by sensors. The application will also provide guidelines for the utilization of the water and purification of water. Thus, water can be used to the best of their knowledge which avoid the wastage of water and pollution of water.

The application built will give the farmers and villagers the idea about the type of water in the well and will enable them to put the water to correct use. The application will guide them which water could be used. Thus, wastage of water is avoided; people will get to drink the water that is fit for drinking and water that are suitable for a crop can be used for irrigation purpose. The advancement of the application could be made by indulging vast data. The motor temperature will be monitored. The pH is one of the water quality parameters which is used to notify whether the water is acidic, basic or which is fit for drinking purpose; the impurity of water or the cloudiness of water is indicated by turbidity which is monitored. To detect the water quality pH sensor (SEN0161) and turbidity sensor (SEN0189) are used. To

check the water temperature thermocouple is used and also to check whether the motor is running under loaded or unloaded condition current sensor (ACS712) is used.

The substation will be created to the bore to increase the efficiency and decrease the load to the sensors. To the existing substation containing water the pH and turbidity sensors will be interfaced. Through wired cables the sensors are connected to Arduino. Network connectivity to the module will be provided by Node Microcontroller which is a Wi-Fi chip.

#### pH Sensor:

pH, commonly used for water measurements, is a measure of acidity and alkalinity, or the caustic and base present in each solution. The value 7 represents neutrality. Based on the increasing and decreasing feature of alkalinity and acidity the number on the scale will vary.

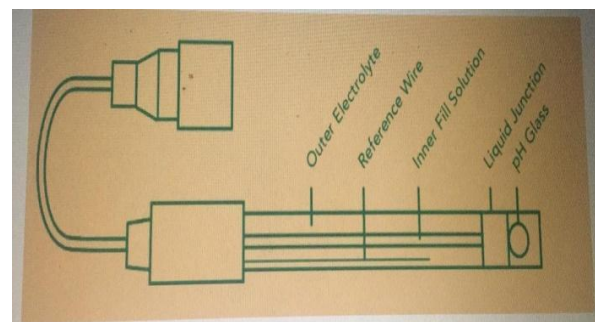


Figure 1: pH Sensor

Electrochemical pH sensor is used to measure the pH value. The differ in the pH value will be detected by electrodes. A high impedance device, known as a pH meter, is used to display the mill volt signal in pH units.

#### Turbidity Sensor:

The presence of undissolved suspended matter in a liquid leads to reduction of transparency of the liquid. This phenomenon is known as turbidity. Turbidity cannot directly measure the suspended particles in water but it has the ability to measure such particles which have light through scattered effects.

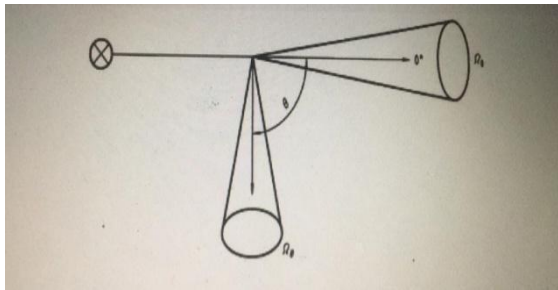


Figure 2: Light scattering different from particle concentration

### IR Sensor:

The heat of an object and detection of motion is done by the IR Sensor. Being an electronic device, this infrared sensor will be emitted in order to sense the surroundings. A passive IR Sensor is one that measures only infrared radiations and does not focus on the emissions. In the infrared spectrum, forms of thermal radiations are radiated by the objects that are present.

These sort of radiations can be observed only by the IR Sensor and not through the naked eyes. Light Emitting Diode(LED) is the emitter used here and IR Photodiode is the detector used which has similar wavelength to that of the emission of the IR LED, but is sensitive to the IR light. There will be changes that occur in the proportion of the magnitude received by the IR light due to the resistance and the output voltages.

### Current and Voltage Sensor:

It is a device that detects electric current in a wire and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. The generated signal can be then used to display the measured current in an ammeter, or can be stored for further analysis in a data acquisition system, or can be used for the purpose of control.

The sensed current and the output signal can be:

Alternating current input,

- Analog output, which duplicates the wave shape of the sensed current.
- Bipolar output, which duplicates the wave shape of the sensed current.
- Unipolar output, which is proportional to the average or RMS value of the sensed current.

Direct current input,

- Unipolar, with a unipolar output, which duplicates the wave shape of the sensed current.
- Digital output, which switches when the sensed current exceeds a certain threshold.

## IV. METHODOLOGY

In this system we make use of Arduino IDE which is a microcontroller board on the AT mega328P. It is an open source electronics platform based on easy to use hardware and software. Arduino Boards read the inputs like light on a sensor, a finger on a button. The board functions like the we want by sending a set of instructions to the microcontroller on the board. To do so we use the Arduino Software(IDE) based on processing.

Blynk is a tool set to control electronics like Arduino, Raspberry Pi and similar ones. Blynk works over the Internet. We use the turbidity sensor to measure water quality. It detects the water quality by measuring the levels of turbidity. It checks the amount of suspended particles in water. This turbidity sensor is used to check the measure of drinking water because if the water is not good, it may lead to high chances of gastrointestinal diseases. pH sensor is basically used in order to measure acidity or basicity of water. It ranges from 0-14. The Ph sensor is responsible for determining solubility and biological availability of water. It is connected to one of the analog ports of the Arduino controller.

The current sensor can be used to obtain a digital output whether the sensed current exceeds a certain threshold. The Voltage Sensor can monitor DC under-voltage or over-volt conditions and deliver a discrete output signal. The Voltage Sensor is a sensor device which compares the sense(input) to an internal reference and determines if the sense line is above or below a predetermined set point.

IoT helps to achieve deeper automation, analysis and integration within the system. They help to achieve accuracy. IoT software addresses its key areas of networking and action through platforms, embedded systems, partner systems, and middleware. These individual and master applications are responsible for data collection, device integration, real-time analytics, and application and process extension within the IoT network.

### IR Sensor:

An Infrared Sensor that detects infrared radiations. It is possible for checking if there is any form of hindrance caused in the system. For instance, there have been cases of children and even pets falling into the ground this is sensed by the IR Sensor. It is connected to the relay where it receives the

responses through signals where it acknowledges detection of a person within the predetermined restricted area. Figure of the IR Sensor is as show below:

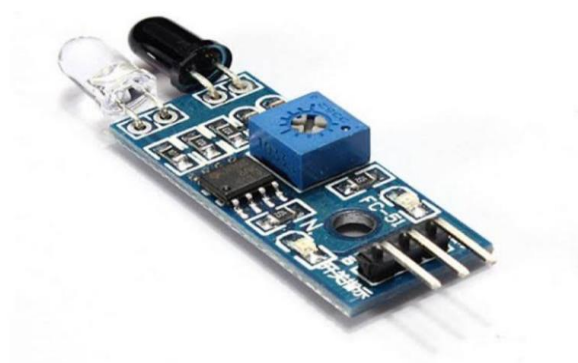
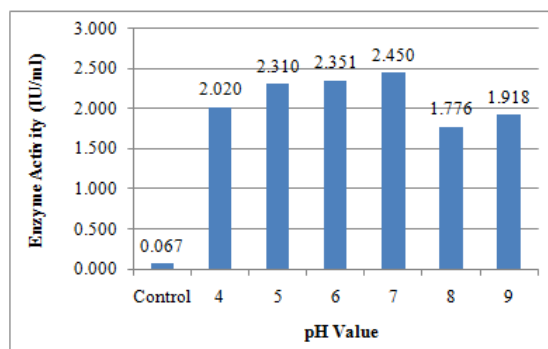
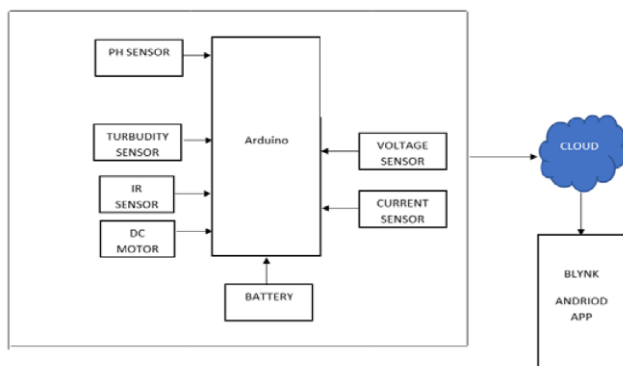


Figure 3. IR sensor

Graphical representation of pH value variation is given below:



**System Design:**



**V. CONCLUSION AND FUTURE SCOPE**

Monitoring of Temperature, pH & Turbidity of Water makes unique advantage on existing GSM network. This can monitor water quality automatically also low in cost and does not require people on duty. So, water quality testing is likely

to be more economical, fast and convenient. The system has good flexibility, only by replacing the corresponding sensors and also changing the relevant software programs, system can be used to monitor other water quality parameters. Water Depletion using the sensors is immediately recognized. The presence of sensors in the system will make the monitoring much easier. The operation is simple. This system can be expanded to air pollution, monitor hydrologic, agricultural and industrial production and so on. It has extension value and widespread application.

Further, detecting the more parameters for most secure purpose. To address the water quality in all the industrial areas. By interfacing relay we controls the supply of water.

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**Special Mention:**

- W3Schools, Available: [www.w3schools.com](http://www.w3schools.com)
- Tutorials Point Website, Available: [www.tutorialspoint.com/php/](http://www.tutorialspoint.com/php/)
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- Arduino : [www.arduino.cc](http://www.arduino.cc)
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