Volume 4 || Special Issue 11 || ICCEME 2019-2020 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

IOT BASED WATER POLLUTION MONITORING SYSTEM FOR REAL TIME APPLICATIONS USING CLOUD

Ujwal Shirode[1], Vedarth Hede[2], Sairaj Kasralikar[3], Sharadchandra Jadhav[4]

Professor, Electronics and Telecommunication Engineering, Pimpri Chinchwad College of Engineering, Pune, India [1]

BE Student, Electronics and Telecommunication Engineering, Pimpri Chinchwad College of Engineering, Pune, India [2 3 4]

ujwalshirode@gmail.com[1], vedarthhede94@gmail.com[2], saikasralikar007@gmail.com[3], sharadjadhav934@gmail.com[4]

Abstract- Water pollution is one of the biggest threats for the green globalization. Water pollution affects human health by causing waterborne diseases. To prevent the water pollution, necessary steps are to be taken. First step is to estimate the water parameters like pH, turbidity, conductivity etc., as the variations in the values of these parameters point towards the presence of pollutants. In the present scenario, water parameters are detected by chemical tester laboratory test, where the testing equipment's are stationary and samples are provided to testing equipment's. Thus, it is a manual system with tedious process and is very time consuming. In order to minimize the time and to make the system automated, the testing equipment's can be placed in the river water and detection of pollution can be made remotely. To ensure the safe supply of drinking water, the quality should be monitored in real time for that purpose Arduino based water quality monitoring has been proposed. In this report, the design of Arduino based water quality monitoring system that monitors the quality of water in real time is presented. This system consists of different sensors which measures the water quality parameter such as pH, conductivity, muddiness of water, temperature.

Keywords: *- Water pollution, Turbidity, PH, Arduino, Electrical Conductivity, Real time Analysis, Cloud based Server.*

I INTRODUCTION

All Water is a fuel for all life forms on earth. Hazardous waste gets mixed with water every-day which arrives through industrialization, globalization, urbanization, agriculture, etc. It is the need of the hour to check the water regularly using agile technologies. From our project we assure that the water quality measuring is done automatically. Initiatives have been taken all over the globe to develop projects based on sampling water to aid in controlling marine environments. Our system will enable the concerned authorities and people to monitor the water standards on a daily basis as the system will generate real time database and upload the same database on the cloud server that can be accessed from anywhere[1]. Many researchers have also demonstrated how wireless sensor networks (WSN) can be used to integrate the internet technology with the water quality monitoring systems[2].our system uses an Arduino board for the purpose. Since the current methods used by the various institutions is human intensive and time consuming, a real time data monitoring system is need of the hour[3] which should also be low cost as to make it available to wide range of population[4].

Effects of pollutants on water quality:

1. Increase in Turbidity
2. Change in pH value.
3. Change in Conductivity of the water.

Turbidity is the cloudiness or muddiness of a fluid which is produced by a large number of independent particles that are generally invisible to the Human eye, like smoke in air. Turbidity is the main method to measure the quality of water. Turbidity hinders the path of light to pass through the water. When the light ray moves through the water with high turbidity, the light ray is scattered in multiple directions. The light that is scattered due to the suspended solids in water is measured by the help of turbidity sensor. More the turbidity, less likely is the drinkability of the water.

The pH of water determines the solubility (amount that can be dissolved in the water) and biological availability (amount that can be utilized by aquatic life) of chemical constituents such as nutrients (phosphorus, nitrogen, and carbon) and heavy metals (lead, copper, cadmium, etc.). For example, in addition to affecting how much and what form of phosphorus is most abundant in the water, pH also determines whether aquatic life can use it. In the case of heavy metals, the degree to which they are soluble determines their toxicity. Metals tend to be more toxic at lower pH because they are more soluble.

Conductivity is a measure of the ability of water to pass an electrical current. Because dissolved salts and other inorganic chemicals conduct electrical current, conductivity increases as salinity increases. Organic compounds like oil do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity.

II HARDWARE

1. CO2 Sensor
2. Turbidity Sensor
3. PH Sensor
4. Electrical Conductivity Sensor
5. Arduino Uno
6. WIFI Module

The component used are explained as follows:

CO2 Sensor:

In this system we are making the use of MQ5 gas sensor for detecting the co2 level in water.

Parts per million (ppm) is the unit which is used for measuring the concentration of co2. One “ppm (parts per million)” is equal to 1 milligram of something per litre of water. The effectively measuring range is from 0 to 5000ppm. This sensor is based on non-dispersive infrared (NDIR) technology and has good selectivity and oxygen-free dependency. Besides, its service life could up to 5 years!

Turbidity Sensor:

Turbidity Sensor TSD-10 measures the turbidity (amount of suspended particles) of the wash water in washing machines, turbidity present in water bodies and dishwashers. An optical sensor for Water bodies is a measuring product for a turbid water density or an extraneous matter concentration using the refraction of wavelength between photo transistor and diode. By using an optical transistor and optical diodes, an optical washing machine sensor measures the amount of light coming from the source of the light to the light receiver, in order to calculate water turbidity. The turbidity sensor is shown in the figure 3. This sensor can be easily interfaced with an Arduino, Rasberry pi or any other PLC. It is cylindrical in shape which can be submersed in water to detect its turbidity.

PH Sensor:

pH is the most important parameter of water. A good pH sensor is used to measure the pH of water. It measures the acidic & basic alkaline in the water. It can be defined by using the hydrogen ion concentration with the negative logarithmic. The pH scale range is from 0 to 14, it is logarithmic. The concentration of hydrogen ion values is translated using Ph. The hydrogen ion concentration is small for acidic and if it shows high it is for alkaline solutions.

Electrical Conductivity Level Sensor:

An electrical conductivity meter (EC meter) measures the electrical conductivity in a solution. It has multiple applications in research and engineering, with common usage in hydroponics, aquaculture, aquaponics, and fresh water systems to monitor the amount of nutrients, salts or impurities in the water. It generally has multiple rods that are immersed in water to perform the required task. The only precaution to be taken is that the senor kit is highly sensitive so it should not be put in water for long duration.

Arduino Uno:

A centralized controller is very necessary requirement of a smart wireless system. It is the main backbone of the entire system without which the system cannot work. The Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers. The Arduino Uno is powered with the USB connection or an external power supply. Conductivity, CO2, PH and Turbidity sensors are

connected to the Arduino board. These sensors send the data to Arduino board which is connected to WIFI module for sending this data to the cloud based server.

WIFI Module (ESP8266-ESP 01):

The ESP8266 –ESP 01 is a low-cost Wi-Fi module with support full TCP/IP stack and microcontroller capability produced by expressive Systems. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. The low cost and the way that there were not very many outside segments on the module which proposed that it could in the long run be extremely cheap in volume, pulled in numerous programmers to investigate the module chip and the produce product using it. It has UART baud rate of 115200bps, the input power is 3.3V and the flash memory size is 1MB.

III BLOCK DIAGRAM

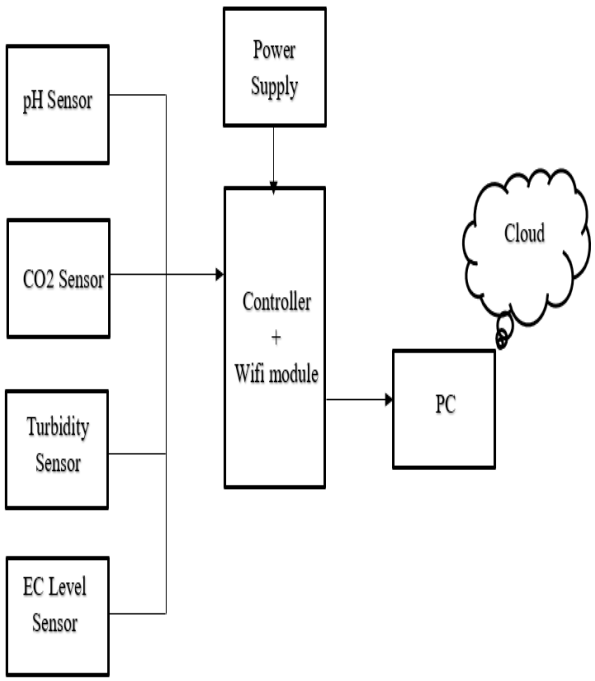


Figure .1.Block diagram showing all the components with connections.

IV WORKING

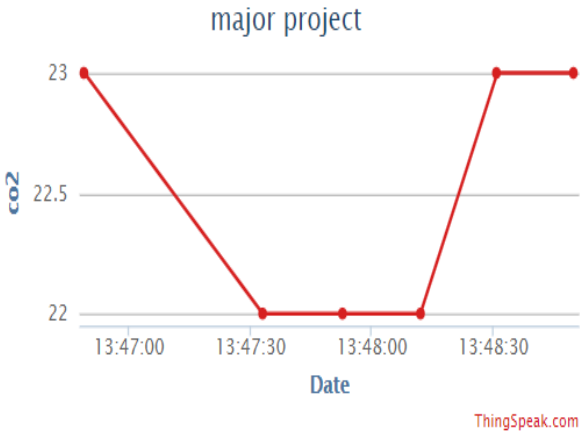
The system is introduced for monitoring the water quality by different sensors such as turbidity, pH, and conductivity. The microcontroller accesses the information which is monitored by the use of sensors. The accessed data are controlled by the use of Arduino microcontroller.

The parameters to be measured in the water quality monitoring system such as the pH level, turbidity, conductivity and co2 level is measured by the sensors and the data is sent to the Arduino Uno board. The sensors used are very sensitive and the sense even the minute of the changes in the water parameters. The data is collected and is processed in the Arduino microcontroller which is in turn connected to the WIFI module. This WIFI module sends all the incoming data from the Arduino microcontroller to a cloud-based server. From this cloud platform we are able to analyze the data collected in the form of live real time graphs.

Thing-speak cloud platform is used to collect this data and perform activities in future. Creation of the database of the water quality in a particular water body and generating a report for future action on limiting the water pollution is the main aim of the system. The system is focused on the design, development and the fabrication of a mobile water pollution monitoring system. The block diagram of the system is shown in fig.1.

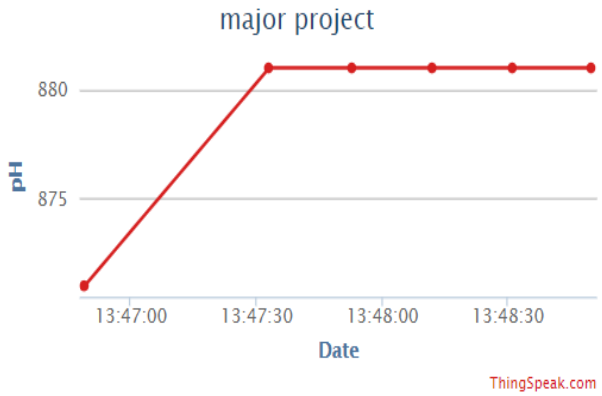
V RESULTS

Once the system is placed is placed in water, it starts to collect and send the data to the cloud platform. The data is analyzed through the graphs shown below,



Graph -1: CO2 level

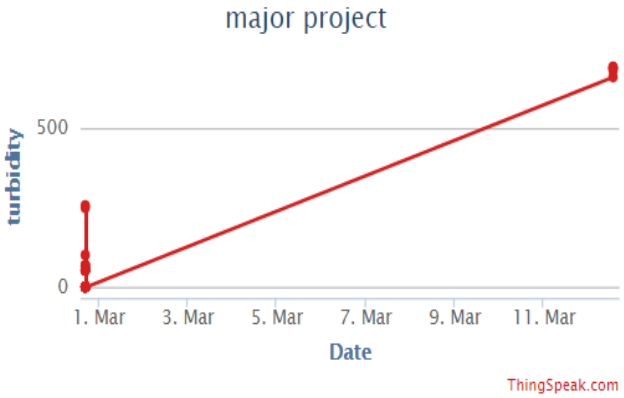
As shown in graph-1, the co2 sensor calculates the co2 level present in the top layer of the water. Seeing the result, we get an idea about the amount of CO2 dissolved in water and also the extent of the water pollution that has taken place in the particular water body.



Graph -2: pH level

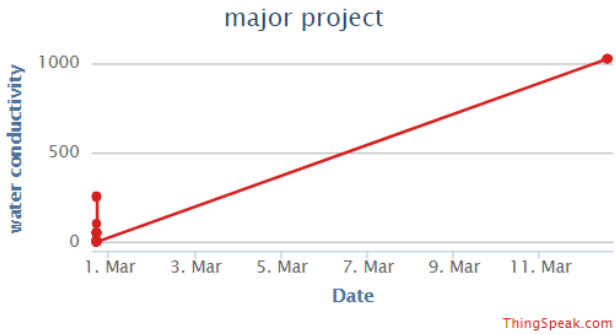
The graph-2 shows the result when the pH sensor is placed in an mixture of oil and water. The pH of the oil generally tends to be in the range of 8.5 to 9 i.e. it is slightly alkaline. From the above result we are able to confirm that the pH value of the oil mixture is in the range 8.7 to 8.82 which is within the expected range.

Whenever the turbidity sensor is placed inside the water, an hinderance in the path of light detected by it. LDR receives less light than normal. Thus depending on the level of the turbidity in the liquid, the sensor gives the output value. from the graph-3 it is clear that initially the liquid (water in this case) is clear. Hence the initial turbidity is zero. As oil is mixed in the water the turbidity increases as it is evident from the above graph.



Graph-3: Turbidity

Pure water is not a good conductor of electricity, this is proved from the graph-4 as the initial value is almost zero. As the oil impurities increase the conductivity of the mixture increases.



Graph-4: Water conductivity

VI CONCLUSION

The water quality parameters such as pH, turbidity, CO2 and electrical conductivity can be observed and tested in real time. Based on the measured data, corporation officials will track the pollution level occur in the water bodies. The Data can be stored in the cloud server that can be accessed from anywhere. It will help them to take proper steps to control the pollution level within the threshold limit. Rapid actions can be taken to control tremendous levels of pollution like in the case of the Godavari, Krishna rivers. The major advantage of the proposed work is, simple for installation and it can be placed very close to the target area.

REFERENCES

[1] Jayti Bhatt, Jignesh Patoliya, Iot Based Water Quality Monitoring System, IRFIC, 21 Feb,2016.

[2] Nikhil Kedia, Water Quality Monitoring for Rural Area- A Sensor Cloud Based Economical Project, in 1st International Conferrence on Next Generation Computing Technologies (NGCT-2015) Dehradun, India, 2015 IEEE.

[3] Mo Dequing, Zhao Ying, Chen Shangsong, Automatic measurement and reporting system of water based on GSM,, Department of Electronic and Technology, 2011 IEEE.

[4] Pavana N R, Dr.M.C. Padma, “Design of Low Cost System for Real Time Monitoring of Water Quality Parameters in IOT Environment”,2016.