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Purpose- Water Quality Monitoring System using IoT

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ABSTRACT: Water is most profitable and valuable source since it is the fundamental need of all the individuals. Now a day we are facing many issues regarding water wastage and quality monitoring in tanks. Toxins from industrial sources may involve worry against accomplishing all-inclusive and impartial access to protected and reasonable drinking water for the coastal areas. For exact observing of water quality, we built up an IoT based water quality measurement system which is low cost and sustainable. In this work we proposed a smart sensor interface device that can sense the water quality parameters and effectively generate data in an online system for showing real-time measures of water quality parameters. It integrates drinking water quality measurement by different types of sensors. These sensors relate to Arduino for the purpose of monitoring the parameters of water quality. For transmitting the values, we create a serial communication between Arduino and Node MCU which will show the data on an online system (web interface). A QR code will be attached with every water source for accessing it easily by any user. They can scan the QR to get sure whether the water is safe to drink or not. The Government can use this system to get information of area's water quality. This system can be also implemented on agriculture related applications and in industrial fields. The design, development and implementation of an IoT based system will help the authorities take the necessary steps to perform proper solutions for the affected area.

I. INTRODUCTION

As per increase in water pollution there is need of controlling pollution in water is finished by monitoring water quality. Our system consists of various sensor which will compute the standard values of water in real time for effective action and is accurate and only less manpower required.

An Internet of Things (IoT) water level control and monitoring system is a smart, automated solution to manage and maintain water levels in various applications such as tanks, reservoirs, and swimming pools. These systems use IoT devices, sensors, and cloud-based platforms to collect, process, and analyze data.

With rapidly rising population in Bangladesh, Fresh Water Management is very much essential which demands an increase in agricultural, industrial and other requirements. The quality of fresh water is characterized by "chemical, physical and biological" content. Monitoring the water quality helps in detecting the pollution in water, toxic chemical and contamination. The traditional method still in vogue entails collection of water samples, analyzing it in lab and advice for any water treatment and so forth. Current water pollution monitoring method takes place in 3 main steps:

1. Water sampling
2. Testing samples
3. Investigative analysis.

All these 3 steps are very expensive, difficult, time-consuming, need expert advice and less efficient. So, with the advent of technology, automation can be brought in water quality monitoring in taking action appropriately rather than relying on manual process. So, in automating the water quality monitoring some amount of technological innovation has crept in which would help in monitoring the quality of water rather than relying on manual process [9]. The quality of the shallow aquifers in and around the textile, bleaching and dyeing units, which use a wide variety of chemicals and dyes at Dhaka, Narayanganj and Gazipur and their environs are highly polluted due to the indiscriminate discharge of untreated effluents in the nearby low-lying lands and rivers and found unsuitable for all purposes. The riverbank and they are using water from the river and discharging the treated and untreated effluents. The people living

in the downstream are using the water for their irrigation, drinking and other domestic activities. There is need of developing better methodologies to monitor the water quality parameters in real-time.

1.1 Internet of Things Applications

The Internet of Things has been a buzzword in the tech industry for years now, but it seems like its applications are only just beginning to be fully realized. One area where the IoT is starting to have a major impact is in water quality monitoring

There are many potential benefits to using the IoT in water quality monitoring. For instance, it can help to provide real-time data that can be used to make decisions about water usage and treatment. This is especially important in areas where water shortages are a concern. Additionally, the IoT can help to identify and track sources of pollution, which is essential for protecting public health and the environment.

Water quality monitoring is an important application of the IoT, but it is only one of many. The IoT has the potential to revolutionize many industries and change the way we live our lives. One potential application of IoT in water quality assessment is the use of sensors to monitor the levels of various contaminants and pollutants in water sources. These sensors can be placed in rivers, lakes, and other bodies of water, and they can collect data on a range of parameters, including pH levels, temperature, dissolved oxygen, and the presence of chemicals and microorganisms. This data can be transmitted in real-time to a central monitoring system, where it can be analyzed and used to identify potential issues and take corrective action if necessary. Another potential use of IoT in water quality assessment is the deployment of smart water meters and other devices in homes and businesses. These devices can monitor water usage, detect leaks, and provide early warning of potential issues, such as the presence of lead or other contaminants in the water supply. By providing real-time data on water usage and quality, these devices can help water utilities to better manage their systems and respond quickly to potential problems.

1.2 Property Analysis for Water Quality

Property analysis for water quality is a process of evaluating the physical, chemical, and biological characteristics of water to determine its suitability for a particular use. This information can be used to make decisions about the treatment of water, the discharge of wastewater, and the protection of water resources.

Property analysis for water quality can be used for a variety of purposes, including:

Assessing the quality of drinking water: Property analysis can be used to determine if drinking water meets regulatory standards and is safe for consumption.

Evaluating the effectiveness of water treatment processes: Property analysis can be used to monitor the performance of water treatment plants and ensure that they are removing contaminants from water.

Identifying sources of water pollution: Property analysis can be used to identify the sources of contaminants in water, such as industrial discharge, agricultural runoff, and sewage leaks.

Developing water quality management plans: Property analysis can be used to develop plans to protect water resources and improve water quality.

Benefits of Property Analysis for Water Quality

Property analysis for water quality can provide a number of benefits to businesses, including:

Reduced costs: By identifying and addressing water quality problems early, businesses can avoid costly repairs and downtime.

Improved efficiency: Water quality problems can lead to inefficiencies in production and operations. By addressing these problems, businesses can improve their efficiency and productivity.

Enhanced reputation: Businesses that are committed to water quality can enhance their reputation and attract customers who are concerned about the environment.

Compliance with regulations: Businesses that discharge wastewater are required to meet certain water quality standards. Property analysis can help businesses ensure that they are complying with these regulations.

Property analysis for water quality is an essential tool for businesses that want to protect their operations, their reputation, and the environment.

II. PROPOSED METHOD

Water quality monitoring system using IoT.

This is a fully completed Electronics and Telecommunication engineering final year project report of a Water quality monitoring system using IoT. The report includes detailed information about the Water quality monitoring system using IoT

IoT based Smart Water Quality Monitoring (SWQM) system which helps in incessant measurement of quality of water on the basis of four different parameters of water quality i.e., pH, turbidity. Two different sensors are coupled to Arduino Uno in order to sense the quality parameters. The data collected from all the four sensors are communicated to a desktop application which is developed in .NET platform and the extracted data are matched with the standard values.

Block Diagram

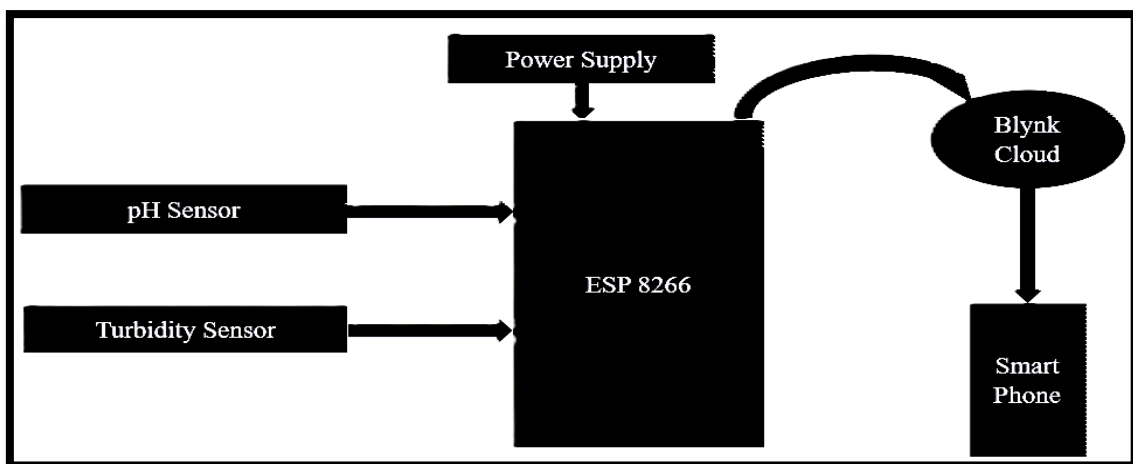


Fig :- Water quality monitoring system using IoT.

In this, we present the theory on real time monitoring of water quality in IoT environment. The overall block diagram of the proposed method is explained. Each and every block of the system is explained in detail.

In this proposed block diagram consist of several sensors (temperature, pH, turbidity, flow) is connected to core controller. The core controller are accessing the sensor values and processing them to transfer the data through internet. Arduino is used as a core controller. The sensor data can be viewed on the internet wi-fi system.

III. COMPONENT INFORMATION

3.1 Components Required

1. pH sensor - (Range : 0 to 14 pH).
2. Turbidity Sensor
3. Node MCU (ESP8266 Wi-Fi Module).

3.2 Component Description

1. pH sensor :



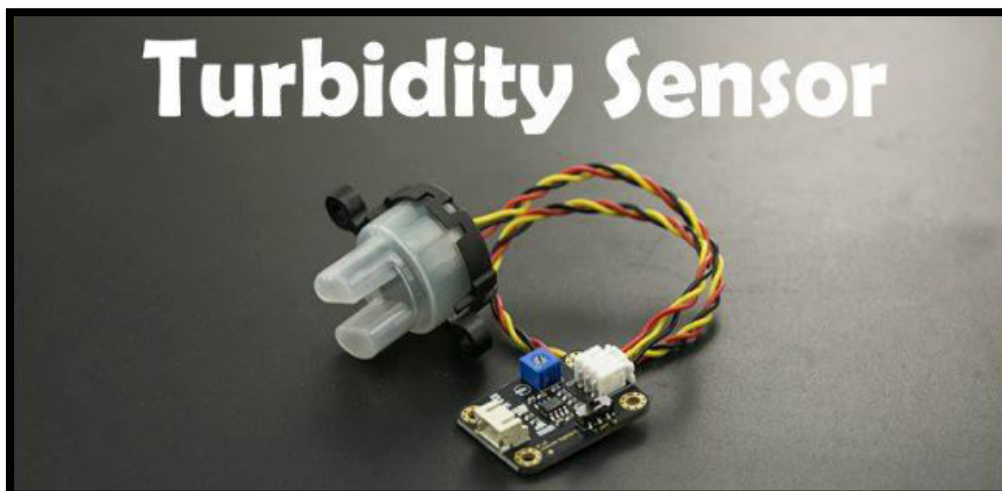
A pH sensor is one of the most essential tools that's typically used for water measurements. This type of sensor is able to measure the amount of alkalinity and acidity in water and other solutions. A pH sensor helps to measure the acidity or alkalinity of the water with a value between 0-14.

Different pH sensors are suitable for different applications, and more than 25% of the quality-related measurements in process control are pH measurements. This is why reliable pH sensors and transmitters are extremely important for plant optimization and process safety. We offer a broad portfolio of products such as stable processes, rapidly changing media composition, viscous media, hazardous areas or water treatment applications. Click the buttons below to learn about our plastic and glass pH sensors, transmitters, meters, calibration and system solutions.

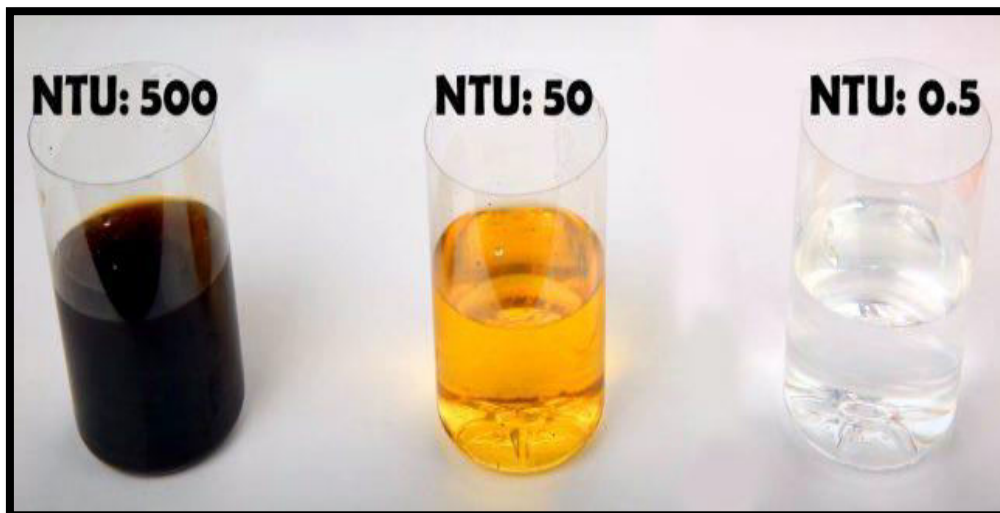
2. Turbidity Sensor :

In this tutorial, we're going to be looking into this turbidity sensor released by DF robot. We will be making a low cost water turbidity meter based on the Arduino, Turbidity Sensor, and the I2C LCD. I will cover the Analog and digital modes of the Turbidity sensor. I will also explain how to calibrate the Turbidity sensor if in case you get the wrong values.

You can also ready my article on **IoT based Water level monitoring and automatic water pump control system** using the ESP8266 WiFi + Bluetooth Module, Waterproof Ultrasonic Sensor, and the **New Blynk V2.0**



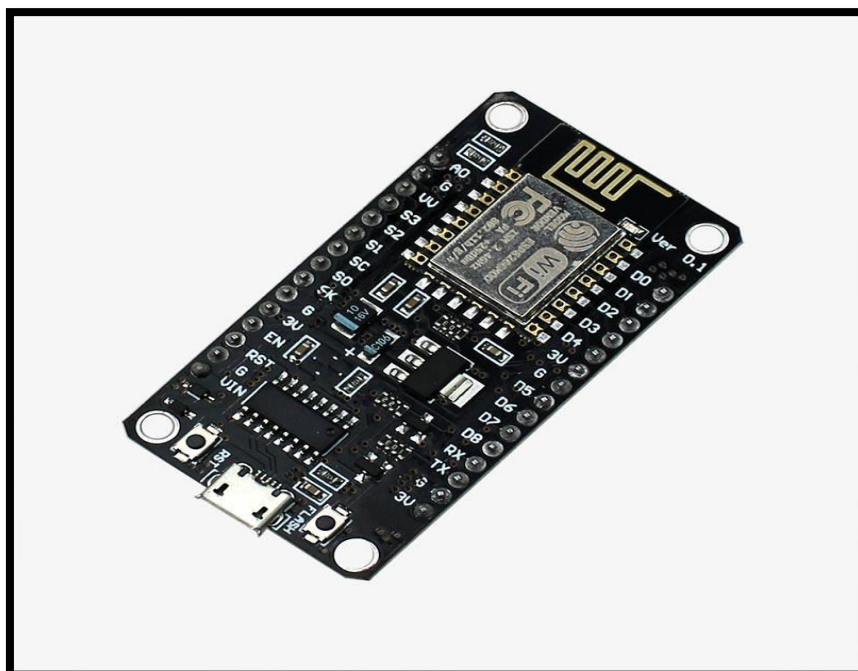
This mechanism is relatively simple as light will be blocked by particles suspending in the liquid. The turbidity can be measured by detecting the amount of light going through the liquid sample.



The turbidity unit is measured in NTU “Nephelometric Turbidity Units” which is global standard. The larger the turbidity is, the cloudy of the sample is. Turbidity sensor connects to the microcontroller through an analog to digital converter through this A to D converter.

3. Node MCU (ESP8266 Wi-Fi Module).

NODE MCU ESP 8266



The ESP8266 Wi-Fi module is basically a complete Wi-Fi solution, which has self-contained integrated TCP/IP protocol stack that can be easily connected to the microcontroller for gaining access to any Wi-Fi network. We can connect this module to any microcontroller like pic microcontroller, Arduino and we can use it as a stand-alone device. For connecting this module to any Wi-Fi network, you can just upload the program to this Wi-Fi module and can use to send data to the Web server or getting HTTP requests.

It is widely used in the Internet of things (IoT) and working voltage of this module is 3.3V. We can use this module with our Arduino development boards that are used in simple as well as complex projects in order to provide Wi-Fi to Arduino development boards, as no Arduino development board comes up with built-in Wi-Fi feature so far. So in

short, we can say that every ESP8266 module comes up preprogrammed with AT command set firmware and can be plugged with any other development board to act as a Wi-Fi shield.

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