IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.53

Volume 4, Issue 5, April 2024

# IOT Based Drinking Water Quality and TDS Monitoring using ESP 32

**Prof. Mr. R. R. Bhambare, Prof. Mr. S. R. Kale, Miss. Wakchaure Sakshi[1], Miss. Sonawane Pragati[2], Miss. Nikita Nehe[3], Miss. Phapale Pranjali[4]**

Department of Electronics Engineering

Pravara Rural Engineering College, Loni, Maharashtra, India

**Abstract:** *The increasing importance of water quality monitoring in ensuring safe and sustainable water resources has led to the development of innovative technologies. This paper presents an Internet of Things (IoT) based water quality monitoring system designed to address the challenges associated with traditional manual monitoring methods. The proposed system leverages IoT technologies to provide real-time monitoring and analysis of key water quality parameters, including temperature, pH, dissolved oxygen, turbidity, and conductivity. The proposed IoT-based water quality monitoring system offers several advantages over traditional methods, including reduced manual effort, improved accuracy, and enhanced real-time monitoring capabilities. It enables early detection of water quality issues, leading to timely interventions to protect public health and optimize water resource management. The system has the potential to be implemented on a large scale, benefiting both urban and rural areas, and contributing to the overall sustainability of water resources.*

**Keywords:** Internet of Things, pH sensor, Turbidity sensor, Temperature sensor, ESP32, WI-FI module

## I. INTRODUCTION

Water is a valuable natural resource bestowed upon mankind, and its quality plays a vital role in the health of humans and animals. The contamination of water can lead to various diseases, impacting the entire ecosystem's life cycle. Lakes, reservoirs, and canals are significant sources of drinking water, but due to the rapid growth of the population, these water resources have become polluted and contaminated. The pollutants in water encompass viruses, bacteria, fertilizers, parasites, pharmaceutical products, pesticides, nitrates, faecal waste, phosphates, radioactive substances, and plastics. To address this issue, the Central Pollution Control Board has established groups of observation points to monitor the purity and quality of water. Traditionally, water pollution monitoring involved manually collecting water samples from different locations and conducting rigorous laboratory testing. However, this method is time-consuming, lacks precision, and incurs high costs.

## II. LITERATURE REVIEW AND OBJECTIVE

### 2.1 Objective

- The sensor nodes will utilize low-power wide area network (LPWAN) technologies.
- The central server acts as a data hub, receiving, processing, and storing the collected data in a database.
- A user-friendly web-based dashboard will be developed to provide real-time visual representations of the monitored water quality parameters.

### 2.2 Literature Review

Several studies have explored the application of IoT in water quality monitoring systems, highlighting the potential of this technology to address the limitations of traditional methods. In a study by Zhang et al. (2018), an IoT-based water quality monitoring system was developed using wireless sensor networks. The system successfully provided real-time monitoring of parameters such as temperature, pH, and conductivity, improving the efficiency and accuracy of water quality assessment. Another research conducted by Li et al. (2020) proposed a water quality monitoring system based on IoT and cloud computing. The system utilized a combination of wireless sensor networks and cloud-based data analysis to achieve real-time monitoring, data storage, and decision-making support. The study demonstrated the effectiveness of IoT technologies in enhancing water quality monitoring capabilities and enabling proactive management strategies. Furthermore, the work of Wang et al. (2019) focused on the development of an IoT-enabled water quality monitoring system for rivers.

### 2.3 Proposed system:

Building upon the existing literature, our proposed system aims to design an IoT-based water quality monitoring system that overcomes the limitation of traditional methods and provides real-time monitoring, data analytics, and decision support.

The system consists of the following key components:

1. Sensor Nodes: High-accuracy sensors will be deployed at strategic locations within the water distribution network to measure key water quality parameters such as temperature, pH, dissolved oxygen, turbidity, and conductivity.
2. Communication Network: The sensor nodes will utilize low-power wide area network (LPWAN) technologies.
3. Central Server: The central server acts as a data hub, receiving, processing, and storing the collected data in a database.
4. Web-based Dashboard: A user-friendly web-based dashboard will be developed to provide real-time visual representations of the monitored water quality parameters.
5. Decision Support System: The proposed system will incorporate a decision support system that utilizes the analysed data to provide recommendations and alerts in case of water quality deterioration.

### 2.4 System Requirements and Components:

**System requirements:**

- Arduino application
- C and c ++ programming
- ESP32 (Wi-Fi Module)
- PH sensor
- Turbidity Sensor
- Temperature Sensor

## III. COMPONENTS

**PH sensor:**

A pH sensor is one of the most essential tools that's typically used for water measurements. This type of sensor can measure the amount of alkalinity and acidity in water and other solutions. When used correctly, pH sensors can ensure the safety and quality of a product and the processes that occur within a wastewater or manufacturing plant.

2.5Materials and Methods:

To set up the ESP32 with Arduino IDE: Download and install Arduino IDE on your computer. Connect the ESP32 to the computer and select the appropriate port in the Arduino IDE. Write and compile the firmware using the Arduino IDE, which supports the Lua scripting language. Connecting sensors to ESP32: Connect the pH, turbidity, and temperature sensors to different pins on the ESP32.Use jumper wires to establish connections between the sensors and the ESP32.Ensure that each sensor is connected to a separate pin to obtain values from different sensors.Programming ESP32 with Arduino IDE: Open Arduino IDE and write the code to read values from the sensors. Compile the code and check for any errors. Upload the compiled code to the ESP32 using the Arduino IDE. Once the code is uploaded, the ESP32 can read values from the sensors.

**Our system contains following steps :**

**Monitoring water quality:** helps to identify specific pollutants, a certain chemical, and the source of the pollution There are many sources of water pollution: wastewater from sewage seeping into the water supply; agricultural practices (e.g., the use of pesticides and fertilizer); oil pollution, river and marine dumping, port, shipping and industrial

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

activity. Monitoring water quality and a water quality assessment regularly provides a source of data to identify immediate issues – and their source.

**Identifying trends, short and long-water quality:** term, in Data collected over a period of time will show trends, for example identifying increasing concentrations of nitrogen pollution in a river or an inland waterway. The total data will then help to identify key water quality parameters.

**Environmental planning methods:** water pollution prevention and management.Collecting, interpreting and using data is essential for the development of a sound and effective water quality strategy.

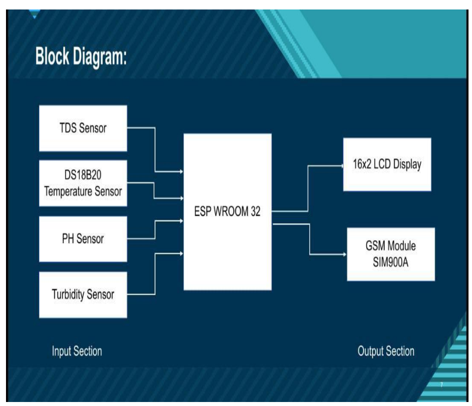
### 3.1 Existing work

Water Quality Monitoring with ESP32 on Thingspeak Server Once it connects to the WiFi Network, it will start reading the EC & Temperature values from the Sensor. You can open the Serial Monitor to read those values. The temperature sensor will show the room temperature.

### 3.2 Working of System:

A GSM module is a device that allows electronic devices to communicate with each other over the GSM network. GSM is a standard for digital cellular communications, which means that it provides a platform for mobile devices to communicate with each other wirelessly.

**Block Diagram of System:**



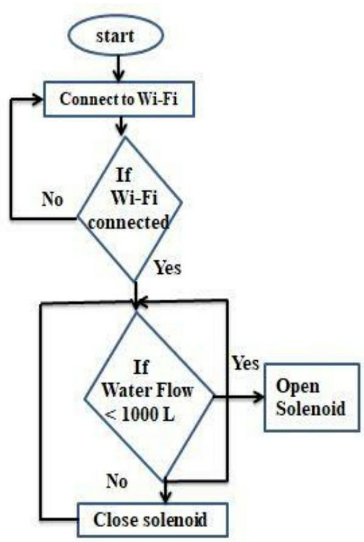




Fig: Connection Wi-Fi and Water Flow Controller

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, April 2024

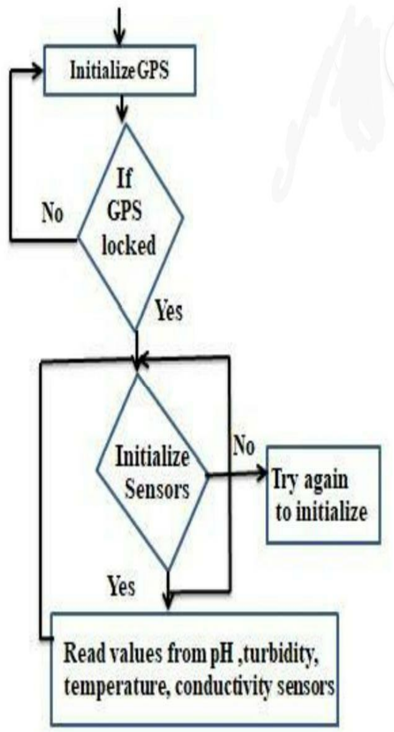



Fig: Initialisation of Sensor

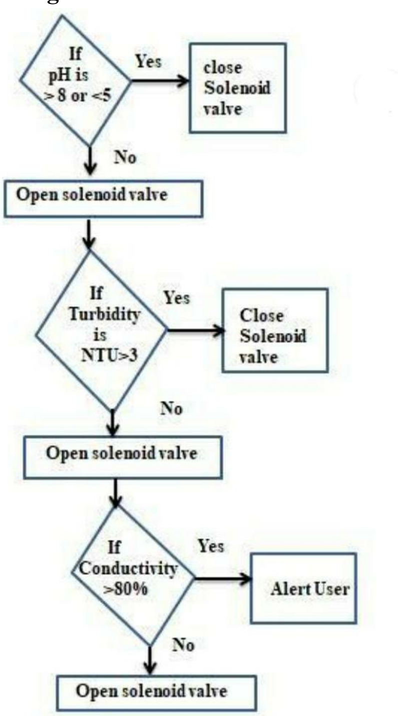



Fig: Working of Water quality Sensor

## IV. RESULTS AND DISCUSSION

The ESP32 is programmed using the Arduino IDE, sensors are connected to different pins on the ESP32, the Arduino IDE is used to write and upload the code, readings are obtained by immersing the sensors in water, the ESP32 sends the readings to the Thing Speak cloud platform, and a mobile app developed with MIT App Inventor displays the collected sensor values to the user.

## V. CONCLUSION

In conclusion, the IoT-based water quality monitoring system presents a promising solution for addressing the limitations of traditional methods in monitoring and managing water quality. By leveraging the power of IoT technologies, the system enables real-time monitoring, data analytics, and decision support, contributing to efficient water resource management and safeguarding public health. So the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple. This system could also be implemented in various industrial processes. The system can be modified according to the needs of the user and can be implemented along with lab view to monitor data on computers.

## ACKNOWLEDGEMENTS

I thank Prof of B.E Electronics Engineering, PREC, Loni, for her continuous support and encouragement for completing this research paper and also thanks to PREC Electronics department for the continuous support.

## REFERENCES

[1] Nikhil Kedia, Water Quality Monitoring for Rural Areas- A Sensor Cloud Based Economical Project, in 1st International Conference on Next Generation Computing Technologies (NGCT-2015) Dehradun, India, 4-5 September 2015. 978-1-4673-6809-4/15/$31.00 ©2015 IEEE

[2] Jayti Bhatt, JigneshPatoliya, Iot Based Water Quality Monitoring System, IRFIC, 21feb,2016.

[3] Michal lom, ondrejpriby&miroslavsvitek, Internet 4.0 as a part of smart cities, 978-1-5090-1116-2/16/$31.00 ©2016 IEEE

[4] Zhanwei Sun, Chi Harold Liu, ChatschikBisdikia_, Joel W. Branch and Bo Yang, 2012 9th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks

[5] (SECON), 978-1-4673-1905-8/12/$31.00 ©2012 IEEE

[6] SokratisKartakis, Weiren Yu, Reza Akhavan, and Julie A. McCann, 2016 IEEE First International Conference on Internet-of-Things Design and Implementation, 978-1-4673-9948-7/16 © 2016IEEE

[7] MithailaBarabde, shrutiDanve, Real Time Water Quality Monitoring System,IJIRCCE, vol 3, June 2015.

[8] AkankshaPurohit, UlhaskumarGokhale, Real Time Water Quality Measurement System based on GSM , IOSR (IOSR-JECE) Volume 9, Issue 3, Ver. V (May - Jun. 2014)

[9] Eoin O'Connell, Michael Healy, Sinead O'Keeffe, Thomas Newe, and ElfedLewis, IEEE sensors journal, vol. 13, no. 7, July 2013, 1530-437x/$31.00 © 2013 IEEE

[10] Nidal Nasser, Asmaa Ali, LutfulKarim, Samir Belhaouari, 978-1-4799-0792-2/13/$31.00 ©2013 IEEE

[11] Niel Andre cloete, Reza Malekian and Lakshmi Nair, Design of Smart Sensors for Real-Time Water Quality monitoring, ©2016 IEEE conference