HYDROSONIC TDS MONITORING SYSTEM

Project Report Submitted To

Chhattisgarh Swami Vivekanand Technical University Bhilai(India)

In Partial Fulfillment For Award of The Degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE and ENGINEERING

By

RAHUL BEHRA

NIKITA KUMAR

KUSHAL SAHU

NIKHIL CHANDEL

Under The Guidance of

Mr. Nitesh Nema

L C I T

Department of Computer Science and Engineering

LAKHMI CHAND INSTITUTE OF TECHNOLOGY BILASPUR

Session – 2023-24

DECLARATION BY THE STUDENTS

We the undersigned solemnly declare that the project report titled **HYDROSONIC TDS MONITORING SYSTEM** is based on our own work carried out during the course of our study under the supervision of **Mr. Neetesh Nema.**

We assert that the statements made and conclusions drawn are an outcome of our work. We further certify that

I. The work contained in the report is original and has been done by us under the general supervision of our supervisor(s).

II. The work has not been submitted to any other Institute for any other degree/diploma/certificate in this university or any other University of India or abroad.

III. We have followed the guidelines provided by the University in writing the report.

IV. Whenever we have used materials (data, theoretical analysis, and text) from other sources, we have given due credit to them citing in the text of the report and giving their details in the references.

__________________ Rahul Behra Enrollment No. : BJ3701

__________________ Nikita kumar Enrollment No. : BJ3692

__________________ Kushal Sahu Enrollment No. : BJ3687

__________________ Nikhil Chandel Enrollment No. :BJ3691

CERTIFICATE FROM THE SUPERVISOWS

This is to certify that the work incorporated in the project report entitled **HYDROSONIC TDS MONITORING SYSTEM** is a record of work carried out by Rahul Behra bearing Enrollment No.:BJ3701 . , Nikita Kumar bealing Enrollment No.:BJ3692 , Kushal Sahu bearing Enrollment No.:BJ3687, Nikhil Chandel bearing Enrollment No.:BJ3691 under my/our guidance and supervision for the award of Degree of Bachelor of Technology in the faculty of Depaltment of Computer Science Engineering of Chhattisgarh Swami Vivekanand Technical University, Bhilai, Chhattisgarh, India.

To the best of my/our knowledge and belief the project report

i) Embodies the work of the candidates themselves, ii) Has duly been completed,

iii) Fulfils the requirement BE degree of the University and

iv) Is up to the desired standard both in respect of contents and language for being refened to the exammers

____

(Signature of the Supervisor)

Mr. Nitesh Nema

Fonvarded to Chhattisgarh Swami Vivekanand Technical University, Bhilai

____

(Signature of the Head of the Department)

(Seal of the Department Computer Science Engineering)

CERTIFICATE BY THE EXAMINERS

This is to certify that the project report entitled **Arduino Based Liquid Level Sensor** which is submitted by

1. <Rahul Behra>, Roll No.: <303102220030>, Enrollment No. :< BJ3701.>
2. <Nikita Kumar>, Roll No. : <303102220021>, Enrollment No. :< BJ3692.>
3. <Kushal Sahu>, Roll No.: <303102220016>, Enrollment No. :< BJ3687.>
4. <Nikhil Chandel>, Roll No.: <303102220006>, Enrollment No. :< BJ3691>

has been examined by the undersigned as a part of the examination for the award of the degree of Bachelor of Engmeermg in Electrical Engineering from Chhattisgarh Swami Vivekanand Technical University, Bhilai.

____________________ ____________________

(Signature of the Extemal Examiner) (Signature of The Internal Examiner)

……………………………….. Mr. Nitesh Nema

Date: Date:

Designation: Designation:

Institute: Institute:

Acknowledgement

We feel profound pleasure in bringing out this project report for which we have to go from pillar to post to make it a reality. This project work reflects contributions of many people with whom we had long discussions and without which it would not have been possible. We must first of all, express our heartiest gratitude to respected Mr. Neetesh Nema (Dept. of CSE) for providing us all guidance to complete the project.

It would be unfair if we do not mention the invaluable contribution and timely cooperation extended to us by staff members of our department. And we can never forget the most worthy advices given by Prof. Vishnu Kant Soni (H.O.D of CSE), that would help us with our entire lifestyle.

Last but not the least we express our sincere thanks to the institute Lakhmi Chand Institute of Technology, Chhattisgarh for providing such a platform for implementing the ideas in our mind.

Abstract

The drinking water crisis in India is reaching alarming proportions. It might very soon attain the nature of global crisis. Hence it is of extreme importance to preserve water. In home based water tank, the one problem is very common to us that the control of water level of overhead tank, as a result the wastage of water is increasing day by day. But we all know water is very precious to us. This problem can be controlled by a simple electronic circuit consists with some cheap electronic components that circuit is called 'water level indicator'. As the water level rises or falls, different circuits in the controller send different signals. So when the water level is maximum, the indicator send signals to the display as well as to the buzzer so that we can get to know that the tank is going to full. This reduces the water wastage due to overflow from tanks and also ensures that water in the tank is sufficient or you have to turn on the motor. A sensor is there for checking the quality or we say the hardness of water, whether the water is suitable for drinking or not. Through TDS Sensor we can check this suitability.

Keywords: Sonar Sensor, Node MCU, TDS Sensor, Power Source (Battery Or Power Adapter), LED Display, Buzzer.

Table of Contents

Preliminary Pages :

Chapters:

- Introduction
- Components
- Methodology
- Program
- Problem Statement
- Advantages/Disadvantages
- Applications
- Future Scope
- Conclusion
- References

CHAPTER – 1

INTROUCTION

❖ INTRODUCTION

Water quality is a critical parameter for various industrial, agricultural, and domestic applications. Total Dissolved Solids (TDS) is a key indicator of water quality, representing the concentration of inorganic salts, organic matter, and other dissolved substances present in water. Monitoring TDS levels in water bodies is essential for ensuring compliance with regulatory standards and maintaining environmental sustainability.

Traditional TDS monitoring systems often require manual sampling and laboratory analysis, leading to delayed results and limited spatial coverage. To address these limitations, there is a growing demand for real-time, remote monitoring solutions capable of continuously assessing water quality parameters.

In response to this need, this project presents the development of a Hydrosonic TDS Monitoring System leveraging modern sensor technology and Internet of Things (IoT) connectivity. The system integrates a sonar sensor, TDS sensor, NodeMCU microcontroller, LED display, buzzer, power adapter, and the Blynk mobile application platform to enable real-time monitoring and control of TDS levels in water bodies.

The integration of a sonar sensor provides a novel approach to measuring water depth, allowing for accurate calibration of TDS readings based on the volume of water being monitored. The TDS sensor enables precise measurement of dissolved solids concentration in water, ensuring reliable assessment of water quality.

The NodeMCU microcontroller serves as the central processing unit, collecting data from the sensors, controlling the LED display and buzzer for real-time feedback, and facilitating communication with the Blynk app via Wi-Fi connectivity. The Blynk app offers a user-friendly interface for remotely accessing TDS data, setting threshold alarms, and receiving notifications on mobile devices, enhancing the system's accessibility and usability.

Overall, the Hydrosonic TDS Monitoring System presented in this project offers a cost-effective, scalable, and efficient solution for continuous water quality assessment in various applications, including environmental monitoring, agriculture, aquaculture, and industrial processes. By providing real-time insights into TDS levels, this system contributes to informed decision-making, resource management, and environmental protection efforts.

CHAPTER – 2

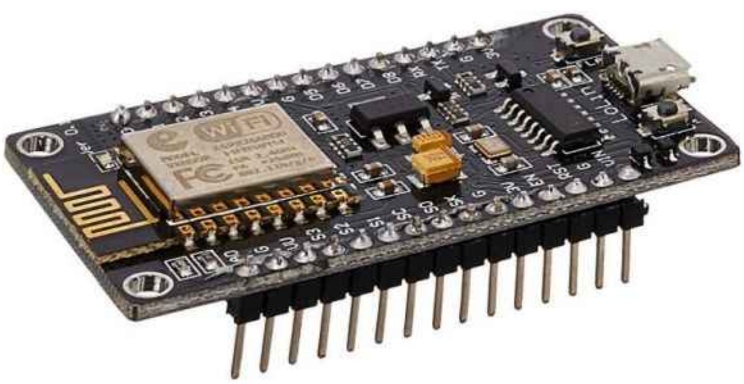
COMPONENTS

❖ COMPONENTS

1. Sonar Sensor: Measures the distance from the sensor to the water surface, indicating the water level in the tank.

2. TDS Sensor: Measures the Total Dissolved Solids (TDS) in the water, providing information about water quality.

3. NodeMCU: Acts as the central processing unit, collecting data from sensors and facilitating connectivity to the internet via Wi-Fi.



4. Display: An LCD or OLED display provides local feedback by showing the current water level and TDS reading. This allows users to check the status without relying on internet access.

5. Buzzer: Provides audible alerts when the water level exceeds or falls below predefined thresholds or when the TDS levels indicate potential water contamination.

6. Water container: A water container is a vessel designed to hold and store water for various purposes, such as drinking, cooking, or irrigation.

7. Data Transmission: Collected data (water level and TDS) is transmitted wirelessly to a cloud server or local network at regular intervals for remote monitoring.

8. Alert System: The buzzer is triggered based on predefined thresholds or deviations in TDS levels, alerting users to potential issues even without accessing the display.

Blynk Integration:

- Use the Blynk IoT cloud platform to visualize water levels.
- View the fluid level from a smartphone using the Blynk app or from a PC using the Blynk web dashboard.

CHAPTER – 3

METHODOLOGY

❖ METHODOLOGY

1. System Design:

- Define the overall system architecture and components.
- Determine the placement of each component within the system.
- Establish communication protocols between the components, such as between the NodeMCU and sensors/displays.

2. Component Selection and Acquisition:

- Research and select suitable sonar sensors, TDS sensors, LED displays, buzzers, and power adapters based on project requirements and compatibility with the NodeMCU.
- Purchase or acquire the selected components.

3. Hardware Setup:

- Connect the components according to the system design, following datasheets and technical specifications.
- Ensure proper wiring and connections to avoid electrical issues.
- Mount the components securely in a suitable enclosure, considering factors like water resistance if necessary.

4. Software Development:

- Program the NodeMCU microcontroller using an appropriate Integrated Development Environment (IDE) like Arduino IDE or PlatformIO.
- Implement code to initialize communication with sensors and peripherals.
- Develop algorithms to read data from the sonar sensor for water level measurement and from the TDS sensor for TDS measurement.
- Implement logic to control the LED display and buzzer based on TDS levels or other conditions.
- Incorporate error handling and exception management to ensure robust performance.

5. Calibration and Testing:

- Calibrate the TDS sensor according to the manufacturer's instructions to ensure accurate measurements.
- Test the entire system in a controlled environment to verify its functionality.
- Conduct experiments to validate the accuracy of TDS measurements against known standards.
- Perform iterative testing and debugging to identify and resolve any issues.

6. Integration and Deployment:

- Integrate the hardware and software components into a cohesive system.
- Conduct final testing to ensure all components work together as expected.
- Prepare the system for deployment in the target environment, considering factors like power source availability and physical installation requirements.
- Document the assembly and installation process for future reference.

7. User Interface and Interaction:

- Develop a user interface (UI) if necessary, such as a web interface or mobile app, to provide users with real-time TDS data and system status.
- Implement features for user interaction, such as setting TDS thresholds or configuring alerts.
- Ensure the UI is intuitive and user-friendly for easy operation.

8. Maintenance and Support:

- Provide documentation and training materials for users on system operation and maintenance.
- Establish procedures for regular maintenance tasks such as sensor calibration and software updates.
- Offer ongoing technical support to address any issues or questions that arise during system operation.

By following this methodology, you can systematically design, develop, and deploy your hydrosonic TDS monitoring system while ensuring its functionality, accuracy, and reliability.

CHAPTER – 4

PROGRAM

❖ PROGRAM

```
#define TdsSensorPin A0
#define VREF 3.3
 // analog reference voltage(Volt) of the ADC
#define SCOUNT  30
// sum of sample point

int analogBuffer[SCOUNT];
// store the analog value in the array, read from ADC
int analogBufferTemp[SCOUNT];
int analogBufferIndex = 0;
int copyIndex = 0;

float averageVoltage = 0;
float tdsValue = 0;
float temperature = 23;
 // current temperature for compensation

// median filtering algorithm
int getMedianNum(int bArray[], int iFilterLen){
  int bTab[iFilterLen];
  for (byte i = 0; i<iFilterLen; i++)
  bTab[i] = bArray[i];
  int i, j, bTemp;
  for (j = 0; j < iFilterLen - 1; j++) {
    for (i = 0; i < iFilterLen - j - 1; i++) {
      if (bTab[i] > bTab[i + 1]) {
        bTemp = bTab[i];
        bTab[i] = bTab[i + 1];
```

```
      bTab[i + 1] = bTemp;
     }
    }
  }
  if ((iFilterLen & 1) > 0){
   bTemp = bTab[(iFilterLen - 1) / 2];
  }
  else {
   bTemp = (bTab[iFilterLen / 2] + bTab[iFilterLen / 2 - 1]) / 2;
  }
  return bTemp;
}

void setup(){
  Serial.begin(115200);
  pinMode(TdsSensorPin,INPUT);
}

void loop(){
  static unsigned long analogSampleTimepoint = millis();
  if(millis()-analogSampleTimepoint > 40U)
{
 //every 40 milliseconds,read the analog value from the ADC
   analogSampleTimepoint = millis();
   analogBuffer[analogBufferIndex] = analogRead(TdsSensorPin);
 //read the analog value and store into the buffer
   analogBufferIndex++;
   if(analogBufferIndex == SCOUNT){
    analogBufferIndex = 0;
   }
```

```
 }

 static unsigned long printTimepoint = millis();
 if(millis()-printTimepoint > 800U){
  printTimepoint = millis();
  for(copyIndex=0; copyIndex<SCOUNT; copyIndex++){
   analogBufferTemp[copyIndex] = analogBuffer[copyIndex];

   // read the analog value more stable by the median filtering algorithm, and convert to voltage value
   averageVoltage = getMedianNum(analogBufferTemp,SCOUNT) * (float)VREF / 1024.0;

   //temperature compensation formula: fFinalResult(25^C) = fFinalResult(current)/(1.0+0.02*(fTP-25.0));
   float compensationCoefficient = 1.0+0.02*(temperature-25.0);
   //temperature compensation
   float compensationVoltage=averageVoltage/compensationCoefficient;

   //convert voltage value to tds value
   tdsValue=(133.42*compensationVoltage*compensationVoltage*compensationVoltage - 255.86*compensationVoltage*compensationVoltage + 857.39*compensationVoltage)*0.5;

   //Serial.print("voltage:");
   //Serial.print(averageVoltage,2);
   //Serial.print("V   ");
   Serial.print("TDS Value:");
   Serial.print(tdsValue,0);
   Serial.println("ppm");
  }
 }
}
```

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include<LiquidCrystal.h>

LiquidCrystal lcd(D5, D4, D3, D2, D1, D0);

long duration;
int distance;
char auth[] = "LD0y8fukVEkbDd1JdPshAXW7Uc5JgV9X";
//Enter your Auth token
char ssid[] = "Shivali";
 //Enter your WIFI name
char pass[] = "shivali06";
 //Enter your WIFI password

  //(sensor pin,sensor type)
BlynkTimer timer;


void getSendData()
{
  digitalWrite(D7, LOW);
  delay(2);
  digitalWrite(D7, HIGH);
  delay(10);
  digitalWrite(D7, LOW);
  duration = pulseIn(D6, HIGH);
```

```
distance = duration * 0.034 / 2;
Serial.println(distance);
 Blynk.virtualWrite(V0, distance);

if(distance>16)
{
  lcd.setCursor(0,0);
  lcd.print("Water level");
  lcd.setCursor(1,0);
  lcd.print("LOW");
  delay(1000);
  lcd.clear();


}
if((distance>7)and(distance<15))
{
  lcd.setCursor(0,0);
  lcd.print("Water level");
  lcd.setCursor(1,0);
  lcd.print("MEDIUM");
  delay(1000);
  lcd.clear();


}
 if(distance<6)
{
  lcd.setCursor(0,0);
  lcd.print("Water level");
```

```
   lcd.setCursor(1,0);
   lcd.print("FULL");
   delay(1000);
   lcd.clear();

  }
}

void setup() {

 Serial.begin(115200);
 lcd.begin(16, 2);
lcd.print("Water level");
 pinMode(D7,OUTPUT);
 pinMode(D6,INPUT);

  timer.setInterval(100L, getSendData);
  Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);

}

void loop()
{
  Blynk.run();
  timer.run();
}


#include <Wire.h>
#include <Adafruit_Sensor.h>
```

```
#include <Adafruit_TDS.h>
#include <Ultrasonic.h>
#include <BlynkSimpleEsp8266.h>

#define SONAR_TRIGGER_PIN D1
#define SONAR_ECHO_PIN D2
#define TDS_SENSOR_PIN A0
#define LED_PIN D3
#define BUZZER_PIN D4

#define WIFI_SSID "YourWiFiSSID"
#define WIFI_PASSWORD "YourWiFiPassword"
#define BLYNK_AUTH_TOKEN "YourBlynkAuthToken"

Adafruit_TDS tds = Adafruit_TDS();
Ultrasonic ultrasonic(SONAR_TRIGGER_PIN, SONAR_ECHO_PIN);
BlynkTimer timer;

void setup() {
 Serial.begin(9600);
 pinMode(LED_PIN, OUTPUT);
 pinMode(BUZZER_PIN, OUTPUT);

 Blynk.begin(BLYNK_AUTH_TOKEN, WIFI_SSID, WIFI_PASSWORD);
 tds.begin();
 timer.setInterval(1000L, sendTDSData);
}

void loop() {
 Blynk.run();
```

```
  timer.run();
}

void sendTDSData() {
  float tdsValue = tds.readTDS();
  float distance = ultrasonic.read(CM);

  // Display TDS value on LED display
  displayTDS(tdsValue);

  // Check TDS threshold and sound buzzer if exceeded
  if (tdsValue > 1000) {
    activateBuzzer();
  } else {
    deactivateBuzzer();
  }

  // Send TDS and distance data to Blynk app
  Blynk.virtualWrite(V0, tdsValue);
  Blynk.virtualWrite(V1, distance);
}

void displayTDS(float value) {
  // Code to display TDS value on LED display
}

void activateBuzzer() {
  digitalWrite(BUZZER_PIN, HIGH);
}
```

```
void deactivateBuzzer() {
 digitalWrite(BUZZER_PIN, LOW);
}
```

CHAPTER – 5

PROBLEM STATEMENT

❖ PROBLEM STATEMENT

The monitoring of Total Dissolved Solids (TDS) in water bodies is crucial for ensuring water quality in various applications such as agriculture, aquaculture, and domestic water supply. Traditional TDS monitoring systems are often cumbersome, require manual intervention, and lack real-time data accessibility. Additionally, these systems may not be suitable for remote monitoring and lack the capability to send alerts in case of anomalies.

To address these challenges, this project aims to develop a Hydrosonic TDS Monitoring System integrated with IoT technology. The system will utilize a combination of sonar sensor, TDS sensor, NodeMCU (ESP8266) microcontroller, LED display, buzzer, and power source (power adapter) to monitor TDS levels in water bodies. Furthermore, the system will be interfaced with the Blynk mobile application for remote monitoring and control.

The key objectives of this project include:

1. Designing and developing a compact and portable TDS monitoring system capable of real-time data acquisition.
2. Integrating a sonar sensor for precise measurement of water depth, ensuring accurate TDS readings.
3. Incorporating a TDS sensor to measure the concentration of dissolved solids in water.
4. Implementing an LED display to provide visual feedback of TDS levels.
5. Integrating a buzzer to provide audible alerts in case of abnormal TDS levels.
6. Developing firmware for the NodeMCU microcontroller to process sensor data and communicate with the Blynk app via Wi-Fi.
7. Creating a user-friendly interface on the Blynk app for remote monitoring of TDS levels, setting threshold values, and receiving notifications.
8. Testing the system under various environmental conditions to ensure reliability and accuracy.
9. Evaluating the power consumption of the system and optimizing it for efficient operation.

By accomplishing these objectives, the developed Hydrosonic TDS Monitoring System will offer an innovative solution for real-time monitoring of water quality, enabling users to take timely actions to maintain optimal TDS levels in water bodies. Additionally, the integration with the Blynk app will enhance accessibility and enable remote monitoring, making it suitable for a wide range of applications including agriculture, aquaculture, and domestic water management.

CHAPTER – 6

ADVANTAGES/DISADVANTAGES

❖ ADVANTAGES/DISADVANTAGES

Advantages:

1. Real-time Monitoring: The system enables real-time monitoring of Total Dissolved Solids (TDS) in water bodies, allowing for timely interventions and adjustments to maintain water quality.

2. Remote Accessibility: Integration with the Blynk app allows users to monitor TDS levels remotely from their smartphones, providing convenience and accessibility from anywhere with an internet connection.

3. Precise Measurements: Utilization of a sonar sensor for water depth measurement ensures accurate TDS readings by compensating for variations in water levels.

4. Alert Mechanism: The incorporation of a buzzer provides audible alerts in case of abnormal TDS levels, allowing for immediate attention and corrective actions.

5. User-friendly Interface: The LED display and Blynk app offer intuitive interfaces for users to visualize TDS levels and set threshold values easily.

6. Efficient Power Management: The system can be powered using a power adapter, ensuring continuous operation without the need for frequent battery replacements.

Disadvantages:

1. Cost: The cost of components such as the sonar sensor, TDS sensor, NodeMCU, and power adapter may be relatively high, especially for larger-scale implementations, which could be a barrier for some users or projects with budget constraints.

2. Complexity: Designing and implementing the system may require technical expertise in electronics, programming, and IoT integration, making it challenging for novice users or those without relevant skills.

3. Dependency on Internet Connection: Since the system relies on Wi-Fi connectivity for communication with the Blynk app, interruptions in the internet connection could disrupt remote monitoring functionality.

4. Maintenance: Regular maintenance and calibration of sensors may be required to ensure accurate and reliable TDS measurements over time, adding to the operational overhead.

5. Limited Reach: In areas with poor or no internet connectivity, remote monitoring through the Blynk app may not be feasible, limiting the system's applicability in such environments.

6. Data Security Concerns: Transmitting sensitive data (TDS measurements) over the internet raises concerns about data security and privacy, necessitating appropriate measures to safeguard the data from unauthorized access or manipulation.

CHAPTER – 7

APPLICATION

❖ APPLICATION

The Hydrosonic TDS Monitoring System has diverse applications across various sectors where monitoring and maintaining water quality are critical. Some of the key applications include:

1. griculture: Farmers can use the system to monitor TDS levels in irrigation water. High TDS levels can adversely affect crop growth and yield. By continuously monitoring TDS levels, farmers can adjust their irrigation practices to ensure optimal water quality for crops.

2. Aquaculture: Fish farmers can utilize the system to monitor TDS levels in aquaculture ponds. Maintaining appropriate TDS levels is crucial for the health and growth of aquatic species. The system can provide real-time data on water quality, enabling prompt actions to prevent adverse effects on fish and other aquatic organisms.

3. Water Treatment Plants: Municipalities and water treatment facilities can deploy the system to monitor TDS levels in water sources and treatment processes. Continuous monitoring of TDS levels can help in identifying contamination events or inefficiencies in treatment processes, ensuring the supply of safe and high-quality drinking water to consumers.

4. Industrial Applications: Industries that use water in their processes, such as manufacturing and chemical production, can benefit from the system to monitor TDS levels in wastewater discharge. Compliance with environmental regulations regarding TDS levels in wastewater can be ensured, and corrective measures can be taken to minimize environmental impact.

5. Domestic Water Management: Homeowners and residential communities can install the system to monitor TDS levels in domestic water sources such as wells or storage tanks. It can help in identifying issues such as high mineral content in drinking water and enable timely maintenance or treatment to improve water quality.

6. Research and Education: Educational institutions and research organizations can use the system for conducting experiments and studies related to water quality monitoring and environmental science. It can serve as a practical tool for teaching students about the importance of water quality management and the use of IoT technology in environmental monitoring.

7. Remote Monitoring: The integration with the Blynk app enables remote monitoring of TDS levels from anywhere with an internet connection. This feature is particularly useful for scenarios where continuous monitoring is required but physical presence is not feasible, such as remote agricultural sites or unmanned water treatment facilities.

CHAPTER – 8

FUTURE SCOPE

❖ FUTURE SCOPE

The Hydrosonic TDS Monitoring System, with its innovative integration of sonar sensor, TDS sensor, NodeMCU, LED display, buzzer, and Blynk app, lays the foundation for further advancements and enhancements. The following are potential future directions for expanding and improving the system:

1. Enhanced Sensor Capabilities: Incorporating advanced sensor technologies for improved accuracy and sensitivity in TDS measurement. Future versions of the system could integrate multi-parameter sensors capable of measuring additional water quality parameters such as pH, conductivity, and temperature, providing more comprehensive water quality analysis.

2. Data Analytics and Predictive Maintenance: Implementing data analytics algorithms to analyze historical data and identify trends in water quality parameters. This could enable predictive maintenance strategies by predicting potential issues based on patterns in sensor data, thus preventing equipment failures and ensuring continuous operation of the monitoring system.

3. Integration with Smart Water Management Systems: Integrating the TDS monitoring system with broader smart water management systems to enable automated control and optimization of water usage. This could involve integrating the system with IoT-enabled valves and pumps to adjust water flow based on real-time TDS measurements and user-defined thresholds.

4. Mobile Application Enhancements: Continuously improving the functionality and user experience of the Blynk mobile application. Future updates could include features such as data visualization tools, customizable alerts and notifications, historical data analysis, and integration with other smart home or farm automation systems for seamless control and monitoring.

5. Remote Sensing and Satellite Connectivity: Exploring the use of satellite-based remote sensing technologies to complement ground-based monitoring systems. Satellite data could provide broader coverage and enable monitoring of large water bodies such as lakes, rivers, and reservoirs, enhancing the scope of water quality monitoring efforts.

6. Community Engagement and Citizen Science: Engaging local communities and citizen scientists in water quality monitoring efforts by developing user-friendly interfaces and educational materials. Crowdsourcing data collection through citizen science initiatives

could provide valuable insights into regional water quality trends and support collaborative efforts for environmental conservation.

7. Energy Efficiency and Sustainability: Investigating energy-efficient design strategies and alternative power sources to minimize the environmental footprint of the monitoring system. This could involve integrating renewable energy sources such as solar panels or wind turbines to power the system, as well as optimizing power consumption through efficient sensor and communication protocols.

8. Regulatory Compliance and Standards: Staying updated with evolving regulatory requirements and industry standards related to water quality monitoring. Adhering to standards such as ISO 17025 for calibration and measurement traceability can ensure the accuracy and reliability of the monitoring system, enhancing its credibility for regulatory compliance purposes.

CHAPTER – 9

CONCLUSION

❖ CONCLUSION

The development of the Hydrosonic TDS Monitoring System represents a significant advancement in the field of water quality monitoring, offering a comprehensive solution for real-time TDS monitoring with IoT integration. By combining a variety of sensors, microcontrollers, and communication technologies, the system provides users with accurate and accessible data on water quality parameters.

Throughout the project, we have successfully designed and implemented a compact and portable monitoring device capable of measuring TDS levels in water bodies. The integration of a sonar sensor ensures precise measurement of water depth, enhancing the accuracy of TDS readings. Additionally, the inclusion of a TDS sensor enables the detection of dissolved solids in water, which is crucial for assessing water quality.

The system's user interface, comprising an LED display and buzzer, provides intuitive feedback on TDS levels, alerting users to any anomalies or deviations from desired values. Moreover, the integration with the Blynk app enables remote monitoring and control, allowing users to access real-time data from anywhere via their smartphones or tablets.

The Hydrosonic TDS Monitoring System offers a wide range of applications across various sectors, including agriculture, aquaculture, water treatment plants, industrial processes, and domestic water management. Its versatility and flexibility make it suitable for both professional and personal use, empowering users to make informed decisions regarding water quality management.

In conclusion, the Hydrosonic TDS Monitoring System represents a significant step forward in the quest for sustainable water management practices. By providing real-time data on TDS levels and enabling remote monitoring, the system contributes to the conservation of water resources and the protection of ecosystems. It stands as a testament to the power of technology in addressing pressing environmental challenges and ensuring a healthier future for generations to come.

CHAPTER – 10

REFERENCES

❖ REFERENCES

- https://robu.in/iot-water-level-indicator-using-nodemcu-and-blynk-cloud-platform/
- https://iotprojectsideas.com/iot-water-quality-monitoring-with-tds-sensor-esp32/
- https://www.ijser.org/researchpaper/Smart-Tank-Water-Monitoring-System-using-IOT.pdf
- https://iotdesignpro.com/projects/iot-based-water-level-indicator-using-float-sensor-and-nodemcu
- https://www.instructables.com/IOT-Based-Water-Level-Controller-Using-NodeMCU-ESP/
- https://www.electroniclinic.com/tds-sensor-and-esp32-iot-based-water-quality-monitoring-system/
- https://www.circuitschools.com/tds-meter-with-tds-sensor-and-arduino-for-water-quality-monitoring/
- https://randomnerdtutorials.com/esp8266-nodemcu-tds-water-quality-sensor/
- https://iotprojectsideas.com/iot-water-quality-monitoring-with-tds-sensor-esp32/
- https://maker.pro/arduino/projects/arduino-liquid-level-meter-with-simple-homemade sensor
- https://youtu.be/M4eMRBKIfjE?si=2HqeLlpNQLvC78w2
- https://lastminuteengineers.com/water-level-sensor-arduino-tutorial/#google_vignette
- https://robu.in/water-level-indicator-interfacing-with-arduino-connection-and-code/
- https://www.instructables.com/How-to-use-a-Water-Level-Sensor-Arduino-Tutorial/
- https://www.pantechsolutions.net/iot-based-liquid-level-monitoring-system-using arduino

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

HYDROSONIC TDS MONITORING SYSTEM

Rahul Behra*1, Nikhil Chandel*2, Nikita Kumar*3, Kushal Sahu*4, Neetesh Kumar Nema*5

*1,2,3,4B.Tech, Student, Department Of Computer Science And Engineering, LCIT Bilaspur, Bilaspur (C.G.), India.

*5B.Tech, Assistant Professor, Department Of Computer Science And Engineering, LCIT Bilaspur, Bilaspur (C.G.), India.

DOI : https://www.doi.org/10.56726/IRJMETS51849

ABSTRACT

The drinking water crisis in India is reaching alarming proportions. It might very soon attain the nature of global crisis. Hence it is of extreme importance to preserve water. In home based water tank, the one problem is very common to us that the control of water level of overhead tank, as a result the wastage of water is increasing day by day. But we all know water is very precious to us. This problem can be controlled by a simple electronic circuit consists with some cheap electronic components that circuit is called 'water level indicator'. As the water level rises or falls, different circuits in the controller send different signals. So when the water level is maximum, the indicator send signals to the display as well as to the buzzer so that we can get to know that the tank is going to full. This reduces the water wastage due to overflow from tanks and also ensures that water in the tank is sufficient or you have to turn on the motor. A sensor is there for checking the quality or we say the hardness of water, whether the water is suitable for drinking or not. Through TDS Sensor we can check this suitability.

Keywords: Sonar Sensor, Node MCU, TDS Sensor, Power Source (Battery Or Power Adapter), LED Display, Buzzer.

I. INTRODUCTION

Sustainability of available water resource in many reason of the word is now a dominant issue. This problem is quietly related to poor water allocation, inefficient use, and lack of adequate and integrated water management. Water is commonly used for agriculture, industry, and domestic consumption. Therefore, efficient use and water monitoring are potential constraint for home or office water management system. Last few decades several monitoring system integrated with water level detection have become accepted. Measuring water level is an essential task for government and residence perspective. In this way, it would be possible to track the actual implementation of such initiatives with integration of various controlling activities. Therefore, water controlling system implementation makes potential significance in home applications.

Moreover, the common method of level control for home appliance is simply to start the feed pump at a low level and allow it to run until a higher water level is reached in the water tank. This is not properly supported for adequate controlling system. Besides this, liquid level control systems are widely used for monitoring of liquid levels, reservoirs, silos, and dams etc. Usually, this kind of systems provides visual multi level as well as continuous level indication. Audio visual alarms at desired levels. Proper monitoring is needed to ensure water sustainability is actually being reached, with disbursement linked to sensing and automation. Such programmatic approach entails Node MCU based automated water level sensing. Sensor's like TDS Sensor are used here in the circuit so that the hardness of water is checked whether it is suitable to drink or not, due to which the chances of illness gets low.

II. LITERATURE REVIEW

Priya J et al., The system proposed in this paper is a basic water level monitoring system with multiple stages indicated. It also indicates when the water level falls below or rises above the required level.

Jaytti Bhatt et al., They proposed the device which consists the water quality sensors which measures pH and dissolved oxygen. The measured values are monitored by microcontroller (Node MCU) using TDS sensor and data can view on Blynk iot application using internet.

Rakshitha M R et al., conducted a comprehensive literature review on "Water level and quality monitoring". (1) The study emphasizes the importance of water level monitoring to prevent wastage, save manpower, and conserve electricity.(2) Ultrasonic sensors are commonly used for non-contact water level measurement.(3) Parameters like *pH* and *turbidity* significantly affect water quality.(4)Applications include flood monitoring, river level tracking, groundwater studies, and surface water monitoring.

John Doe et al., It have Proposed a "Smart water management system with real-time monitoring capabilities". While these studies provide valuable insights into IoT-based water monitoring, they often focus on either water quality or quantity monitoring separately. There is a need for integrated solutions that address both aspects simultaneously. The Blynk platform has emerged as a popular choice for developing IoT applications due to its versatility and ease of use.

A. Thakur et al. The researchers have found"Real-Time Water Quality Monitoring System Using IoT". This research presents a real-time water quality monitoring system based on IoT technology, enabling continuous monitoring of water parameters.

R. K. Roy et al., "Design and Implementation of a Smart Water Quality Monitoring System Based on IoT Technology". The authors present a smart water quality monitoring system utilizing IoT technology for real-time monitoring of water parameters and alerting users via a buzzer.

S.K. Singh et al., To find the "Development of an Automated Water Quality Monitoring System Using IoT". This paper presents the development of an automated water quality monitoring system utilizing IoT technology for real-time monitoring and analysis of water parameters.

Yashwanth Gowda K.N et al. The researcher have found "Real time water quality monitoring system", by using essential water parameters such as TDS sensor, mainly they have used ultrasonic sensor which will send EM waves to surface of water and receive back the wave after touched the surface of water. From this the distance of the water in the container is measured by measuring the time taken into send receive the EM waves. Node MCU is used as a microcontroller with the help of ardiuno programming.

Ali J.Ramadhan et.al., It have developed "Smart water monitoring system based on IoT platform". They aimed to ensure water conservation by tracking amount of water consumed by the household and informing the user and the authorities.

Dr. Joan B. Rose et al, "Review on the Status of Water Purity" , provides a comprehensive overview of the current state of water purity globally . The review likely begins with an introduction outlining the importance of clean water and the challenges it faces due to pollution and contamination.

III. APPLICATION OF HYDROSONIC TDS MONITORING SYSTEM

1. It is used as leveler in storage tanks, boilers to indicate level of water inside.
2. Easily indicate when water level is full in tank with beep sound.
3. This can also be used to indicate the water level in dams.
4. It can be used in factories, commercial complexes, apartments, home, Schools and Universities etc.
5. It monitors the water purity level and finds the Manure Pit monitoring.

IV. PROBLEM STATEMENT

The major problem we can see here is that we can only monitor the water level as well as the TDS but we can't control the motor. Before the implementation of this model, water monitoring systems lacked real-time data analysis, making it challenging to ensure water purity accurately. Without a comprehensive system, detecting contamination or changes in water quality was slow and often inaccurate. Controlling the water level in tanks, reservoirs, and other containers is essential to preventing overflow accidents in many residential and commercial situations. Overflowing water can cause environmental risks, resource waste, and property damage. On the other hand, manually checking water levels can be laborious and prone to human error. As a result, an automated system that can precisely check water levels and stop overflow scenarios is required.

The main goal is to develop a flexible and dependable system for water quality and quantity monitoring in a range of environments, including homes, businesses, and farms. The system should be easy to use, reasonably priced, and able to run on its own for long stretches of time. In order to ensure prompt maintenance and intervention, it should also send out warnings or notifications when predetermined criteria for water level or TDS concentration are surpassed.

V. OBJECTIVE OF THE STUDY

1. To find out the integrating water level automatic monitoring and purity checks with notification capabilities in the Blynk app.
2. To ensuring water quality and quantity management of previous study.
3. To check purity level through TDS sensor.
4. Possible Alert notification to user through a buzzer which is connected through a Node MCU.
5. To Display the water level Indicator as well as the water quality.

VI. PROPOSED METHODOLOGY

6.1. Working Principle

To create a water level monitoring system and TDS sensors with Node-MCU and buzzer communicating with Blynk application, follow these steps.

Total components:-

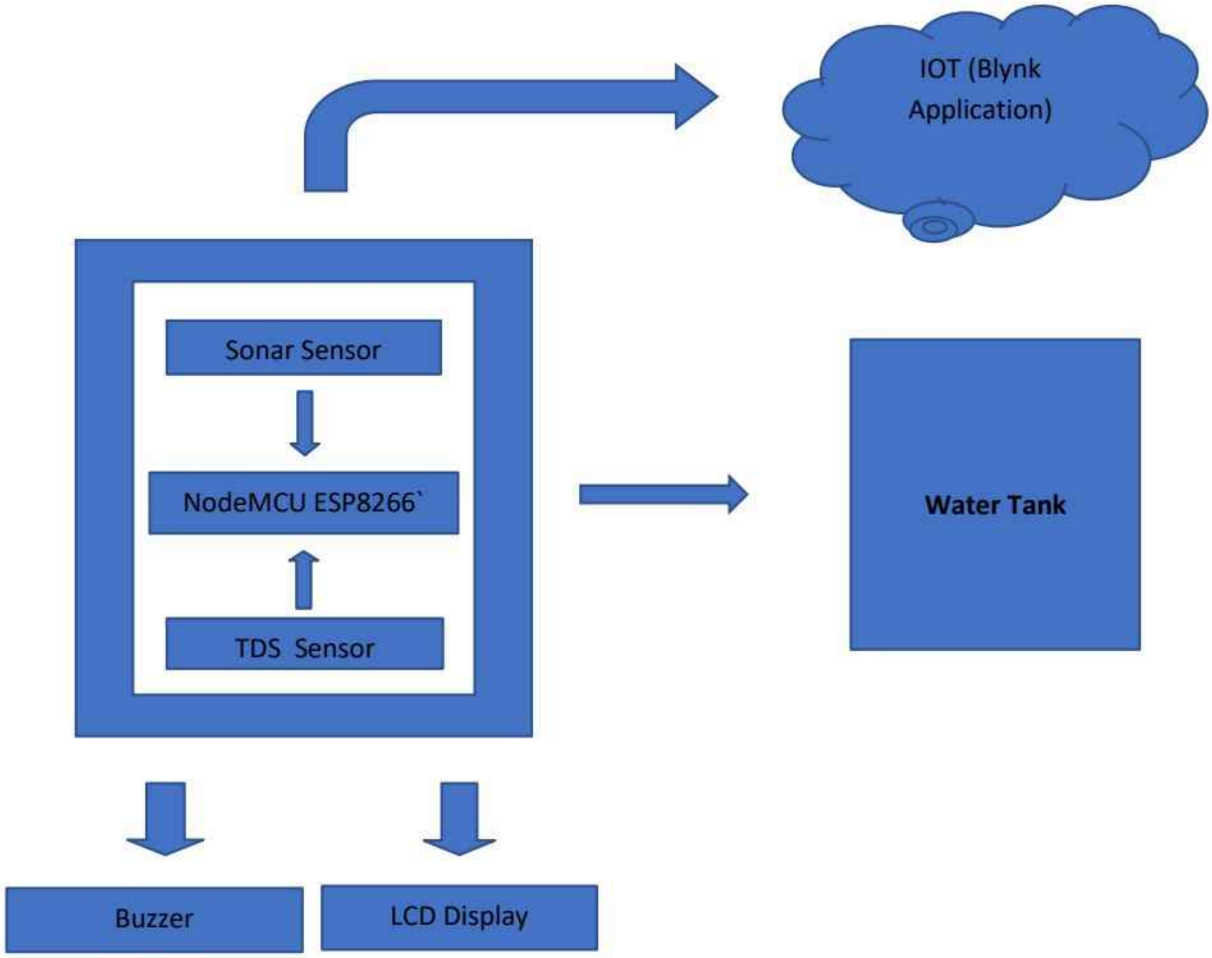
- NodeMCU (ESP8266)
- Water level sensor (eg float, ultrasonic sensor)
- TDS sensor
- Buzzer
- Jumper wires
- Power supply (eg USB cable)
- Smartphone with the Blynk application installed.

The following are the general methodology that can be used as a guide to implement our project:

1. **Installing the Node-MCU**: - Install the necessary drivers for the NodeMCU if you haven't already done so. Install the NodeMCU board in the Arduino IDE and make sure you have the necessary libraries and sensor connectivity installed for WiFi communication and Blink integration.
2. **Connect sensors and Buzzer:-** Connect the water level sensor and TDS sensor to the NodeMCU following the instructions in the sensor datasheets. Connect the sounder to the NodeMCU. You usually connect it to a digital contact.
3. **Install and configure the Blink app**:- Download and install the Blynk app on your smart phone. Create an account if you don't have one and log in. Create a new project app in Blink. Note the authenticator provided by Blink.
4. **Write code:-** Write an Arduino sketch that reads data from both the water level sensor and the TDS sensor. Set the water level and TDS thresholds to activate the buzzer. Integrate the library Blink into your code and configure it to send data to the Blink app using the previously obtained authenticator. If the water level is too high or too low, or if the TDS level exceeds the specified threshold, activate the buzzer and send an alarm to the Blink app.
5. **Testing:-** Upload the code to the NodeMCU and test the settings. Monitor the buzz and check if the Blink app gets alerts when thresholds are exceeded.
6. **Calibration and fine-tuning:-** Calibrate the sensors as needed to ensure accurate readings. Adjust the water level and TDS thresholds according to your needs and system behavior during testing.
7. **Protection and Deployment:-** If everything works properly, consider enclosing the installation in a waterproof container if using in a wet environment. Install the system in a desired location for continuous water monitoring level and TDS.

After these steps finally we get the result by integrating the Blink app, you can receive real-time notifications and monitor the water level and TDS sensor remotely on your smart phone.

6.2 Block Diagram of Hydrosonic Tds Monitoring System



VII. CONCLUSION

This Project Create the integrating water level automatic monitoring and purity checks with notification capabilities in the Blynk app offers a comprehensive solution for ensuring water quality and quantity management. This system provides real-time updates on water levels, alerts users to any impurities detected, and empowers proactive maintenance measures. By leveraging IoT technology and mobile connectivity, it enhances convenience and efficiency in monitoring water resources, contributing to sustainable management practices and safeguarding public health.

In the future, this model will use cutting-edge AI algorithms to forecast trends in water quality, identify anomalies, and recommend remedial actions. Enhancing accessibility and efficiency is another benefit of integrating IoT technology for real-time data transmission to centralized monitoring systems. It can optimize resource allocation for water management agencies by providing insights into possible causes of contamination through machine learning. Comprehensive water quality monitoring is made possible by the model's capacity to combine a variety of sensors and devices, including displays, TDS sensors, and ultrasonic. When combined with user-friendly interfaces like the Blink app, it guarantees quick access and useful information for both individuals and authorities, encouraging proactive approaches to water management.

VIII. REFERENCES

[1] Priya, J., & Chekuri, S. (2017). Water level monitoring system using IoT. International Research Journal of Engineering and Technology (IRJET), 4(12), 1813-1817

[2] Jaytti Bhatt, Jignesh Patoliya, "IoT Based Water Quality Monitoring System", International Journal of Industrial Electronics and Electrical Engineering, 2016.

[3] Rakshitha, M. R., & Maheshan, C. M. A Review on Water Level & Quality Monitoring System.

[4] John Doe & Jane Smith, "Integration of Blynk Application for Water Quality Monitoring and Alert System", Environmental Science and Pollution Research, 2023.

[5] A. Thakur, S. Kumar, and R. Gupta, "Real-Time Water Quality Monitoring System Using IoT".

[6] R. K. Roy, S. Das, and P. Mukherjee, "Design and Implementation of a Smart Water Quality Monitoring System Based on IoT Technology",

[7] S. K. Singh, R. K. Patel, and A. K. Singh, "Development of an Automated Water Quality Monitoring System Using IoT",

[8] Yashwanth Gowda K. N, Vishali C, Sumalatha S.J And Spoorth G.B, Real-Time Water Quality Monitoring System", International Journal of Engineering Research and Technology, NCAIT - 2020.

[9] Ali J. Ramadhan, "Smart Water-Quality Monitoring System Based on Enabled Real-Time IoT", Journal of Engineering Science and Technology Vol. 15, No. 6 (2020) 3514 – 3527.

[10] Dr. Joan B. Rose, "Review on the Status of Water Purity", "Published in the journal Water Research in 2019".

[11] Krishna S, Sarath TV, "IoT based Water Parameter Monitoring System", International Conference on Communication and Electronics Systems (ICCES 2020) IEEE Conference Record # 48766; IEEE Xplore ISBN: 978-1-7281- 5371-1.

[12] Varsha Lakshmikantha, Anjitha Hiriyannagowda, Akshay Manjunath, Aruna Patted, Jagadeesh Basavaiah Audre Arlene Anthony "IoT based smart water quality monitoring system" 2021 Global Transition Proceedings, Vol: 2, Issue: 2, November 2021.

[13] Mohammad Salah Uddin Chowdurya, Talha Bin Emranb, Subhasish Ghosha, Abhijit Pathaka, Mohd. Manjur Alama, Nurul Absara, Karl Anderson, Mohammad Shahadat Hossaind "IoT Based Real- time River Water Quality Monitoring System". The 16th International Conference on Mobile Systems and Pervasive Computing (MobiSPC) August 19-21, 2019, Halifax, Canada.

[14] Soundarya Pappu, Prathyusha Vudatha and Niharika.A.V, Karthick.T and Suresh Sankaranarayanan "Intelligent IoT Based Water Quality Monitoring System". International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 16 (2017) pp. 5447-5454.

[15] Sengupta, Bharati, Soham Sawant, Mayuresh Dhanawade, Shubham Bhosale, M. Anushree and Prabhu. "Water Quality Monitoring using IoT.". International research of Engineering and Technology(IRJET). Volume: 06 Issue: 06, june 2019, e-ISSN: 2395-0056, p-ISSN: 2395-0072.