

Water Quality Monitoring System using ESP32 and TDS Sensor

Aim:

To design and implement a water quality monitoring system using an ESP32 microcontroller and a TDS (Total Dissolved Solids) sensor. The system measures water purity levels and displays live readings on the Blynk IoT platform using Wi-Fi connectivity.

Required Components:

1. ESP32 Development Board
2. TDS Sensor Module
3. Jumper Wires
4. Breadboard
5. USB Cable
6. Blynk IoT App (Mobile + Web)

Procedure:

1. Connect the TDS sensor to the ESP32:
 - TDS VCC → ESP32 VIN
 - TDS GND → ESP32 GND
 - TDS AOUT → ESP32 D32 (GPIO 32)
2. Open the Blynk IoT platform and create a new project.
3. Add a Gauge widget and set its Data Stream to Virtual Pin V0.
4. Add a Label widget and set its Data Stream to Virtual Pin V1.
5. Note your Blynk Template ID and Authentication Token.
6. Upload the provided Arduino code to the ESP32 using the Arduino IDE.
7. Open the Serial Monitor to verify the Wi-Fi connection and live TDS readings.
8. Open the Blynk app to view live TDS and water quality status updates.

Arduino Code:

```
#define BLYNK_PRINT Serial
#define BLYNK_TEMPLATE_ID "TMPL3RXZlCsc-"
#define BLYNK_TEMPLATE_NAME "Water Quality Monitoring"
#define BLYNK_AUTH_TOKEN "ROyOXpTWMpB2iqSiPNfS_EYcghOW9ixb"

#include <WiFi.h>
#include <BlynkSimpleEsp32.h>

char ssid[] = "Sharath";           // your WiFi name
char pass[] = "sharath323";        // your WiFi password

#define TDS_PIN 32

float tdsValue = 0;
float voltage = 0;
BlynkTimer timer;

void sendSensorData() {
    int sensorValue = analogRead(TDS_PIN);
    voltage = sensorValue * (3.3 / 4095.0); // Convert ADC to voltage (ESP32 12-bit ADC)
    tdsValue = (133.42 * voltage * voltage - 255.86 * voltage * voltage + 857.39 * voltage) * 0.5; //

    // Send TDS value to Blynk
    Blynk.virtualWrite(V0, tdsValue);
```

```

// Determine water quality category
String quality;
if (tdsValue < 50)
    quality = "Excellent ■";
else if (tdsValue < 150)
    quality = "Good ■";
else if (tdsValue < 300)
    quality = "Fair ■■";
else if (tdsValue < 500)
    quality = "Poor ■■■";
else
    quality = "Bad ■■■";

// Send the status text to Blynk (Label widget on V1)
Blynk.virtualWrite(V1, quality);

// Print to Serial Monitor
Serial.print("TDS Value: ");
Serial.print(tdsValue);
Serial.print(" ppm | Status: ");
Serial.println(quality);
}

// Improved WiFi reconnect
void checkWiFi() {
    if (WiFi.status() != WL_CONNECTED) {
        Serial.println("Reconnecting WiFi...");
        WiFi.disconnect();
        WiFi.begin(ssid, pass);
    }
}

void setup() {
    Serial.begin(115200);
    delay(1000);

    Serial.println("Connecting to WiFi...");
    WiFi.begin(ssid, pass);

    while (WiFi.status() != WL_CONNECTED) {
        delay(500);
        Serial.print(".");
    }

    Serial.println("\nWiFi connected!");
    Serial.print("IP Address: ");
    Serial.println(WiFi.localIP());

    Blynk.begin(BLYNK_AUTH_TOKEN, ssid, pass);

    // Send data every 2 seconds
    timer.setInterval(2000L, sendSensorData);

    // Check WiFi every 10 seconds
    timer.setInterval(10000L, checkWiFi);
}

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

```