POCKET-SIZED TDS METER

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Abstract - The Pocket-Sized TDS Meter is an innovative and efficient device designed for automatic monitoring of Total Dissolved Solids (TDS) in conventional RO water purifiers. Based on the principle of electronic conductivity of water, the device consists of two conductive rods that are submerged in the water and connected to an AVR microcontroller. The device is calibrated to detect TDS levels between 100-180 ppm, and when the levels exceed this range, an alarm system is activated through a buzzer or an LED light. This compact and easy-to-install device is an ideal solution for ensuring safe and healthy drinking water. Its ability to detect TDS levels accurately and efficiently makes it a must-have for households and commercial establishments alike.

Index Terms - Pocket-sized, TDS, meter, monitoring, Alarm, ppm.

I. INTRODUCTION

Access to safe drinking water is crucial for the health and well-being of individuals and communities. However, the quality of water supplied to households is often compromised by the presence of dissolved impurities such as salts, minerals, and heavy metals. Total Dissolved Solids (TDS) is a measure of the concentration of these impurities in water, which can affect its taste, odor, and overall safety for consumption.

Reverse Osmosis (RO) water purifiers are widely used to remove TDS from drinking water. However, monitoring the TDS levels in these purifiers can be a challenging task, particularly for households that lack the technical expertise or equipment required for this purpose.

To address this issue, the Tiny TDS device has been developed as an innovative solution for automatic monitoring of TDS in conventional RO water purifiers. The device is designed to work on the principle of electronic conductivity of water, which is based on the concentration of ionic particles in the water.

The Tiny TDS device consists of two conductive rods that are submerged in the water and connected to an AVR microcontroller. The device is calibrated to detect TDS levels between 100-180 ppm, and when the levels exceed this range, an alarm system is activated through a buzzer or an LED light.

This paper aims to provide a detailed overview of the Tiny TDS device, its working principle, calibration, and applications. We will discuss the advantages of using this device, such as its ease of installation, compact size, and efficient TDS detection capabilities. We will also compare the Tiny TDS with other existing TDS monitoring solutions, highlighting its unique features and benefits. Overall, this paper will demonstrate how the Tiny TDS device can help households and commercial establishments ensure safe and healthy drinking water.

TDS MEASUREMENT

Pocket-Sized TDS's technical innovation is the use of an AVR microprocessor and a straightforward voltage divider circuit to measure the conductivity of water, making it compatible with a variety of water purification systems. The gadget is calibrated to detect TDS levels between 100 and 180 ppm. Two conductive rods attached to an AVR microcontroller and submerged in water make up the device. When the TDS levels exceed this range, the device's alarm mechanism is activated either a buzzer or an LED light. Additionally, Pocket-Sized TDS has an intuitive display that shows the TDS level in real-time and enables customers to keep an eye on the quality of their drinking water

II. CIRCUIT DIAGRAM

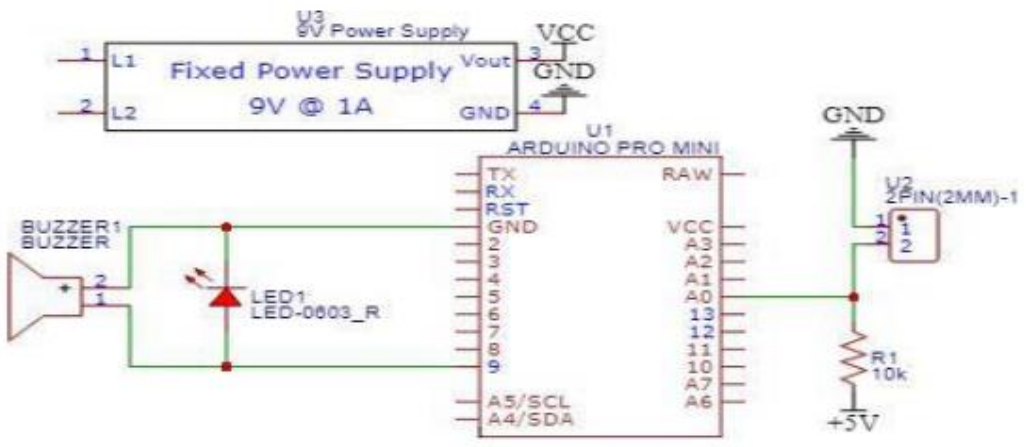

Fig 1. Circuit Diagram

III. DEVICES CONNECTED

AVR MICROCONTROLLER

This microcontroller receives the analog signal generated by the voltage divider circuit and processes it to calculate the TDS level of the water. The microcontroller is programmed to compare the TDS value with the safe range of 100-180 ppm, and when the value exceeds this range, it activates an alarm system.

Fig 2. AVR Microcontroller

CMP Series High Power Anti-Surge Chip Resistors

The pattern in which this component is soldered is available in different ranges from small 0603 (1600 metric) up to 2512 (6432 metrics). It has high resistance, power rating, and pulse power. Thick film elements are used to make this resistor andare used in various things like industry control boards, and digital meters.

Fig 3. CMP Resistor

TS391

This is a comparator which has very low power voltage. It is designed in a very specific way that it can operate from a very small amount of single supply despite having a wide range of voltages. The most unique characteristic of this comparator is its input common-mode voltage ranges including ground which is very rare as it operated from a single supply power voltage. It's used for many industrial purposes like consumer electronics, and power supplies.

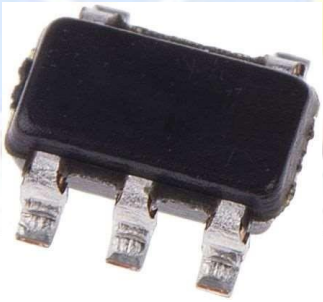

Fig 4. TS391

RESISTORS (10K)

Electronic components known as resistors control how much electrical current may pass through a circuit. They are frequently used to provide a precise resistance value for a component or to manage the voltage or current in a circuit.
A popular resistor value that can be utilized in many different electronic circuits is 10k. It is frequently used as a current-limiting resistor for LEDs, a pull-up or pull-down resistor to set a signal's default state, or as a component of a voltage divider circuit. In analogue circuits like operational amplifiers and filters, it is also frequently utilized.

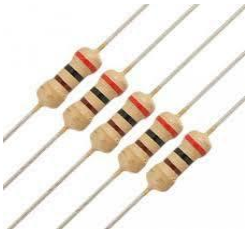

Fig. 5 Resistors (10k)

BUZZER

The alarm system consists of a buzzer that is activated when the TDS level exceeds the safe range. This alerts the user to change the filters in the RO water purifier.

Fig 6. Buzzer

IV. METHODOLOGY

The development of the Pocket-Sized TDS device involved several steps, including design, prototyping, and testing. The device was designed to measure the electronic conductivity of water and calculate the TDS level based on this measurement. The device consists of two conductive rods, a voltage divider circuit, an AVR microcontroller, an alarm system, and a power supply.

To measure the electronic conductivity of water, the two conductive rods were placed at a specific distance from each other and submerged in the water. A voltage divider circuit was used to get an analog value from the water in which the rods were submerged. The voltage divider circuit consisted of a pair of resistors in series, with the conductive rods connected in parallel to the resistors. The analog signal generated by the voltage divider circuit was fed to the AVR microcontroller.

The AVR microcontroller received the analog signal from the voltage divider circuit and processed it using the following formula:

$$EC = k * C$$

$$EC\ 1/R\ (\text{no. of -ve})$$

K = distance btw pins and electrode.

W.r.t to R diff. Will get a analog signal relate to TDS.

where EC is the electronic conductivity of water in micro siemens per centimeter (µS/cm), k is the cell constant of the conductivity meter (which depends on the geometry of the electrodes and the distance between them), and C is the concentration of ions in the water in parts per million (ppm). The cell constant k is typically specified by the manufacturer of the conductivity meter and is used to convert the measured conductivity to the actual electronic conductivity of the water sample. The concentration of ions in the water can be measured using a TDS (Total Dissolved Solids) meter, which measures the amount of dissolved solids (including ions) in the water in ppm.

Once the TDS value was calculated, the microcontroller compared it with the safe range of 100-180 ppm. When the TDS value exceeded this range, the alarm system was activated. The alarm system consisted of a buzzer or an LED light that alerted the user to change the filters in the RO water purifier.

The Pocket-Sized TDS device was prototyped using a breadboard and tested with various water samples. The device was calibrated using standard TDS solutions and tested for accuracy and reliability. The device was also tested with water samples containing different levels of TDS to ensure that it was capable of detecting TDS levels within the desired range of 100-180 ppm.

In summary, the methodology for developing the Pocket-Sized TDS device involved designing the device to measure the electronic conductivity of water using two conductive rods and a voltage divider circuit, calculating the TDS level using an AVR microcontroller and a calibration constant, and activating an alarm system when the TDS level exceeded the safe range. The device was prototyped and tested for accuracy and reliability, and it was found to be an effective solution for maintaining safe and healthy drinking water.

Wormhole attack in wireless sensor network can disturb the routing process and ultimately degrade network performance. In this paper, we have presented existing wormhole attack types and their detection mechanism. Wormhole detection in a dynamic WSN setting is an open research area. A good research direction for wormhole detection is integration of trust based systems and time or distance bounding wormhole detection techniques.

V. NOVELTY

The novelty of Pocket-Sized TDS lies in its ability to provide a simple, affordable, and effective solution for monitoring TDS levels in drinking water. Prior to the invention of Pocket-Sized TDS, measuring TDS levels required expensive and time-consuming water testing procedures, making it impractical for regular use. However, Pocket-Sized TDS utilizes an AVR microprocessor and a straightforward voltage divider circuit to measure the conductivity of water and determine TDS levels between 100 and 180 ppm. The device is equipped with two conductive rods, which are submerged in water, and an alarm mechanism that is activated when TDS levels exceed the recommended range. Furthermore, Pocket-Sized TDS has an intuitive display that shows the TDS level in real-time, enabling customers to monitor the quality of their drinking water easily. The compact size, ease of use, and compatibility with a range of water purification systems make Pocket-Sized TDS a novel and useful tool for ensuring access to safe and healthy drinking water.

VI. REFERENCES

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