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WATER PURITY TESTING USING pH AND TURBIDITY SENSORS

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ABSTRACT

One of the main dangers to a nation's residents, as well as the plants and animals that live in its waterways, is water pollution. Since water makes up 70% of the earth's surface, it is our duty to maintain the water clean. The main cause of water pollution is due to disposal of industrial waste into the river. Residents of that area use the same water. Since it is polluted it causes adverse effect on a citizen’s life. Thus it's important to find dirty water. With the use of sensors, the parameters necessary for detecting water contamination, such as pH and turbidity, are measured in real time. While turbidity is also a crucial parameter since it has a negative impact on aquatic ecosystems, pH is an important measure to define the composition of water. Here, we suggest a system for detecting water contamination while taking into account a number of factors, including cost, ease of setup, and ease of use. Using pH and turbidity sensors, we suggest designing and implementing a system to detect water contamination in this study.

KEY WORDS-*pH sensor, water purity, Turbidity sensors*

I.INTRODUCTION

There are many reasons why natural water resources get contaminated. One of the biggest issues facing the local population is industrial trash. Chemical tests and other laboratory tests can be used in a stationary lab to identify polluted water in a variety of ways. Furthermore, testing apparatus can be inserted into the water supply to detect dirty water remotely. Before providing water to any people, the quality must be checked in order to minimise risks to citizen safety. In the poor world, diarrheal diseases continue to be a major source of illness and mortality, according to the World Health Organization[1]. When it comes to water pollution, pH and turbidity are crucial factors to take into account. A measure of the amount of suspended sediments in water is called turbidity. In our proposed approach, we will take into account three separate factors to determine if water is normal, acidic, or basic. In order for water to be considered safe for use, the ideal pH value is seven, or for normal water. Governments have established standards for the amount of turbidity that is permitted in drinking water. The ideal turbidity value is zero.

Turbidity cannot, in the United States of America, be higher than 1.0 nephelometric turbidity units (NTU) at the plant outlet for systems that use traditional or direct filtration techniques. Systems that use filtration in addition to traditional or direct filtration are required to abide by state regulations, which include turbidity limitations of no more than 5 NTU[2]. There are numerous design standards and water quality standardisation techniques in use[3].

II.PROPOSED SYSTEM

The entities in our suggested system are as follows:

A.Water Purity Detection:

1.pH sensor: pH sensors detect Water is the solution in this case, and pH measures how basic or how acidic an aqueous solution is. It is quantified using the electrical potential method. Since pure water is neutral, its pH value should be 7. Water is considered acidic if the value is less than 7 or basic or alkaline if the value is larger than 7. Figure 1 below depicts the pH electrode that we employed in our system, as indicated by [4].

Fig.1.pH Electrode

2.pH meter: The voltage of the pH electrode is measured using a pH metre, which is nothing more than a precision voltmeter. Due to the extremely high internal resistance of the pH electrode, the majority of commercially available

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voltmeters restrict their use. While the majority of currently available digital metres have internal resistance in the range of 1–10 M, a voltmeter must have an internal resistance at least 100 times bigger to accurately measure voltage. Consequently, they are inappropriate[5]. Careful selection of op-amp is most important while building pH meter circuit. As the op-amp IC TL081 has a very high gain and a very high input impedance, we have used it here to build an amplifier. Switches and resistors in the circuit are necessary for calibration of pH electrode. The figure of pH meter is shown below in figure 2.

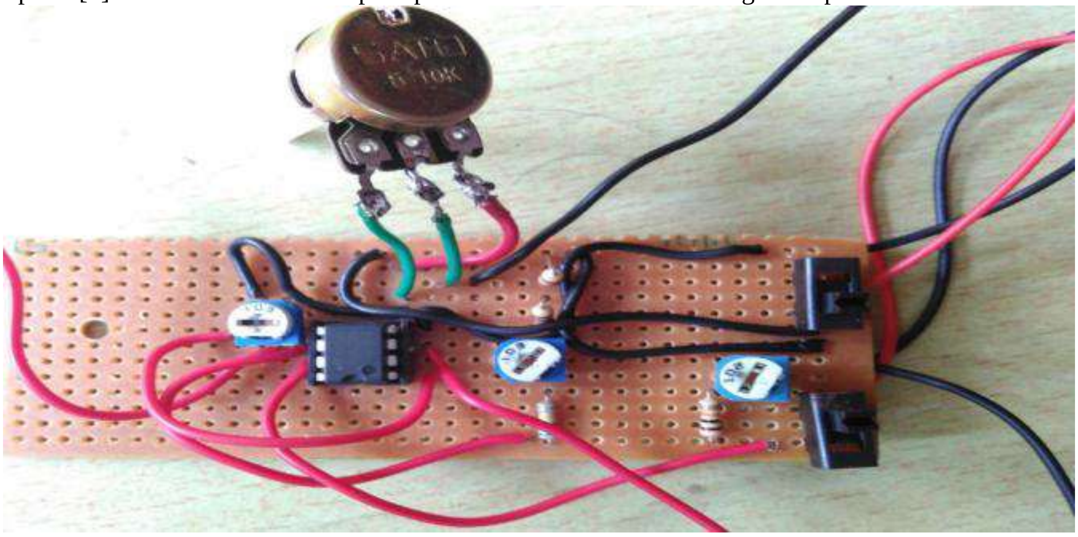

Fig.2.pH Meter

3.Turbidity sensor: An essential factor in determining the water quality is turbidity. Aquatic ecosystems are negatively affected by high turbidity in a number of ways. It includes things like a reduction in light penetration or, occasionally, sunlight blockage, which prevents photosynthesis and hence restricts plant growth, and erosion, which lowers the quality of fish and other creatures' habitats and hinders their ability to obtain food [6]. A high concentration of suspended particles, which is indicated by a high turbidity, can be harmful to fish and other aquatic life. Figure 3 shows the turbidity sensor that we employed in our system. Here, the light source is an LED.

When a pot filled with clear water is placed between an LED and a photo diode, full light will pass through the pot and break the photo diode's junction. This causes the transistor to turn on fully, producing an output of zero that is sent to the ADC of a PIC controller, or, in this instance, a turbidity value of zero. In contrast, less light will flow through the pot when a pot of turbid water is placed between an LED and a photodiode. This will increase the transistor collector voltage, which in turn will increase the amount of turbidity.

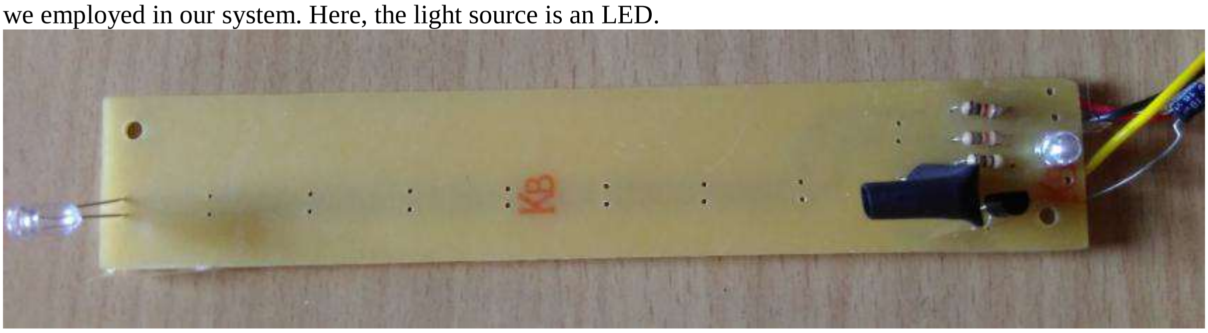

Fig.3.Turbidity Semnsor

4.Arduino: Arduino is an initiative, open-source hardware platform, and software environment for creating electronic gadgets. It creates and produces single-board interfaces and microcontroller kits for use in electronics projects. The original purpose of the Arduino boards was to assist students without a technological background. The controllers and microprocessors used in Arduino board designs are diverse. The Arduino board has groups of analogue and digital I/O (Input / Output) pins that can connect to expansion boards, breadboards, and other circuits. These boards have model, USB, and serial communication ports, which are used to load applications from computers. The Arduino is a single circuit board that has various connections or components on it. The board is made up of a number of digital and analogue pins that are connected to other devices and components to enable the operation of electrical equipment. Fourteen digital I/O pins make up the majority of the Arduino.

5.Power Supply unit: Clock, reset, and power supply are the three essential components that a Arduino controller must have. As a fixed 5V supply is required to drive the Arduino microcontroller, we must utilise a power supply device that does this. A step-down transformer, a bridge rectifier, a filter, a voltage regulator, a power supply LED indication, and a current limiting resistor make up this device. Step down transformer reduces 230 volts of alternating current to 12 volts of alternating current, which is then transformed to 12 volts of direct current using a bridge rectifier and filter circuit. The

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voltage regulator IC is the following part of this device. Here, a fixed positive 5V supply was created using a 7805 integrated circuit. Figure 4 depicts an Arduino power supply unit with a clock and reset functionality.

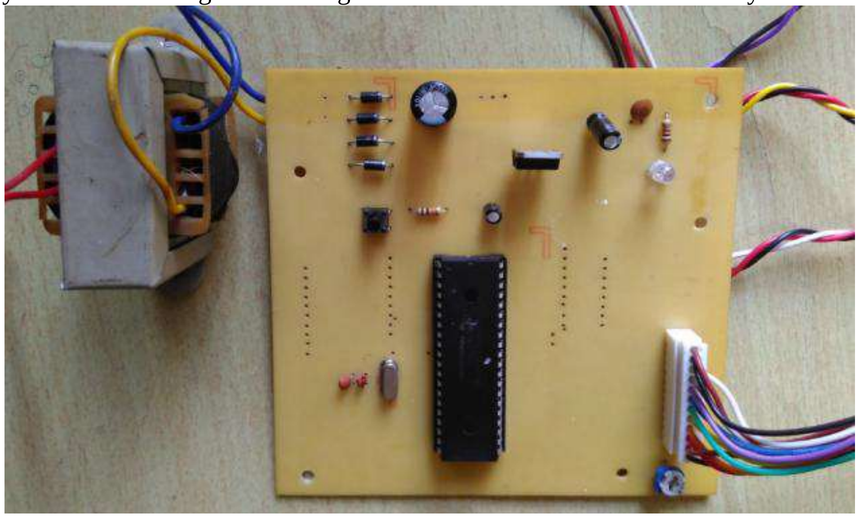

Fig.4.Power Supply

Figure 5 below displays the suggested system's block diagram. All the aforementioned things are included in it. The Arduino controller receives the output of the pH electrode and turbidity sensor. Based on the pH and turbidity values, the outcome will be shown on the LCD.

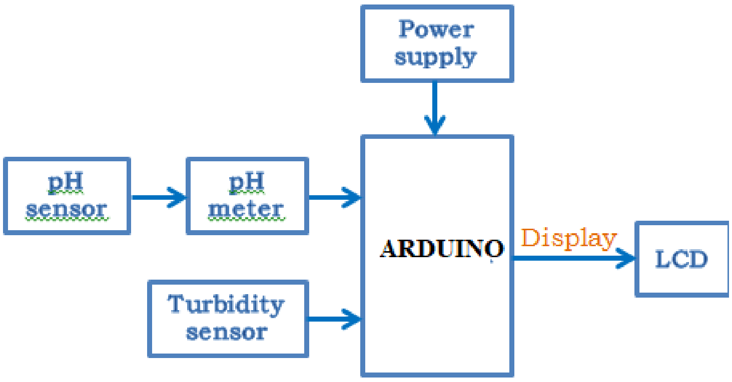

Fig.5.Block Diagram

III.SOFTWARE DESIGN

The Arduino compiler is used for programming. The flow chart below illustrates how pH and turbidity value detection work. The LCD, which is connected to the 16F887A PIC, will display the results in accordance with the pH level of the sample water. Depending on the pH value that was detected, the buzzer will either be "ON" or "OFF".If the pH of the water is 7, the buzzer will be "OFF," signifying neutral water, or "ON," signalling either acidic or basic water. The buzzer will be "OFF" to indicate an acceptable value for water use if the turbidity value is between 0 and 5, and "ON" for values higher than 5 according to the same reasoning.

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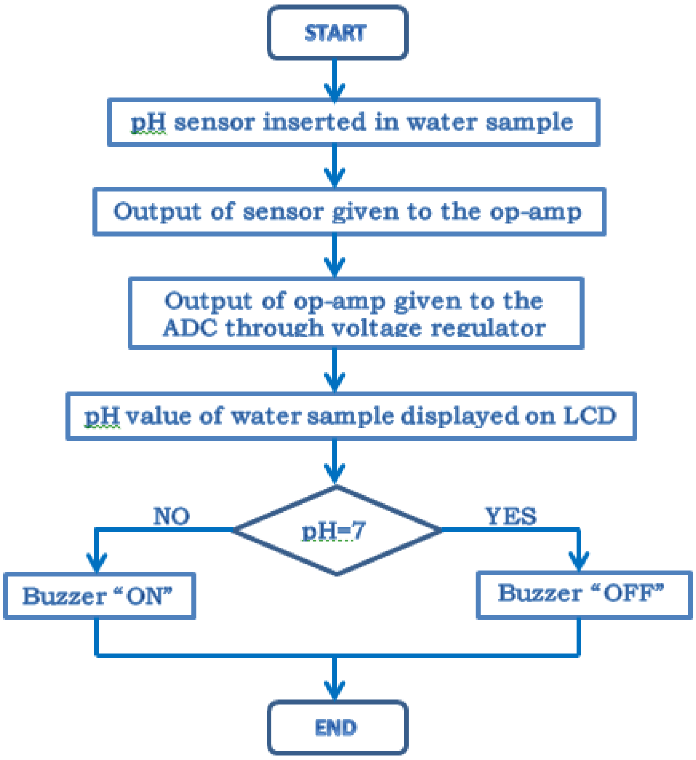

Figure 6: Flow chart showing operation of pH sensor

IV.RESULTS AND DISCUSSIONS

We put the suggested system for detecting dirty water into action. By using several sorts of water samples, we were able to gather a variety of results for different pH values under diverse conditions (neutral, acidic and basic). The pH value for neutral water is 7, while the pH values for acidic and basic water are less than 7 and larger than 7, respectively.The hardware protype has been shown in figure7.

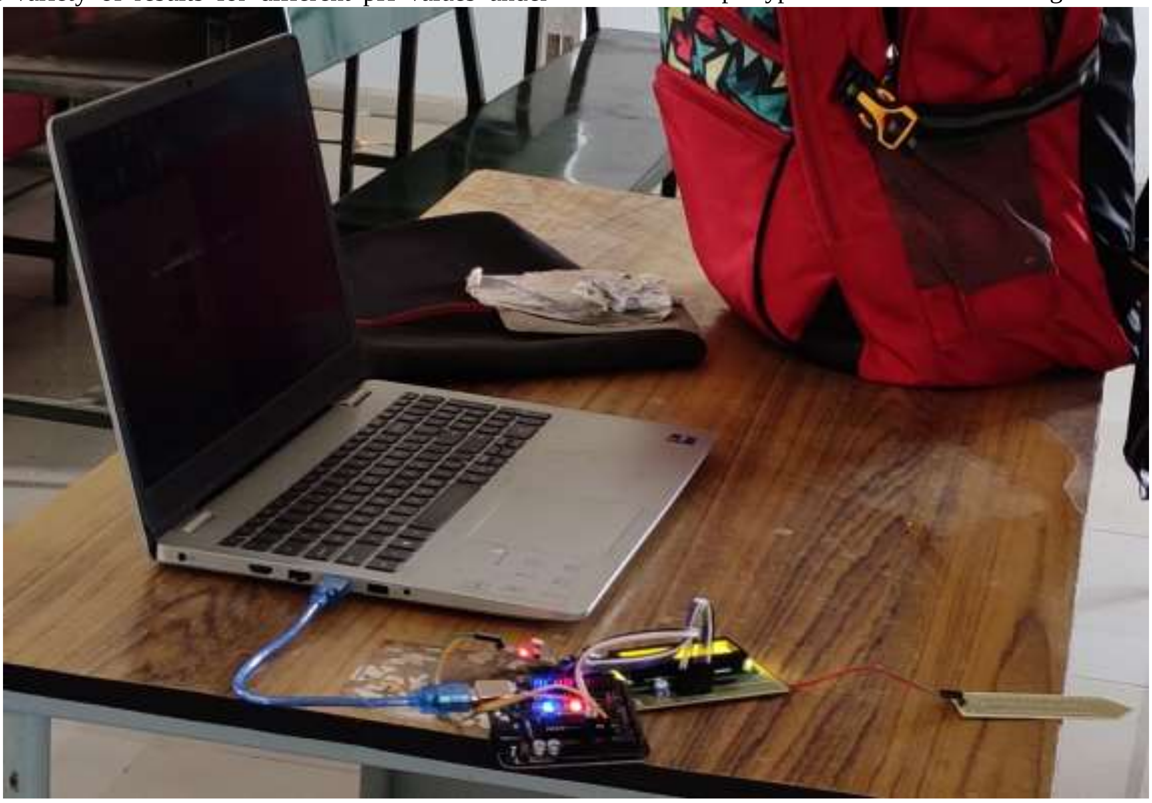

Fig.7.Hardware Prototypical Model

V.CONCLUSION

This work checks the purity of water using pH and turbidity sensors, this research provides a system for detecting water pollution. pH and turbidity sensors gather information on water quality, which is then provided to the 16F887A PIC microcontroller. On the LCD, pH and turbidity parameters are shown based on the type of water. In the future, a system that uses GSM and smart phones to transmit water quality data can be created.

VI.REFERRENCES

1. *http://www.who.int/water_sanitation_health/takingcharge.html*
2. *https://en.wikipedia.org/wiki/Turbidity*
3. *http://www.fondriest.com/environmental-measurements/equipment/ measuring-water-quality/turbidity-sensors-meters-and-methods/*
4. *http://www.businessdictionary.com/definition/pH-scale.html [5] http://www.ph-meter.info/pH-meter-construction*
5. *http://www.fondriest.com/environmental-measurements/ para meters/water-quality/turbidity-total-suspended-solids-water-clarity/*