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IOT BASED SOLAR POWERED WATER QUALITY MONITORING AND ITS PURIFICATION

[1]Mr.G.V.Vinod, [2]Thumuluri Meghana, [3]Doddapaneni Venkat, [4]Irri Hemanth Reddy, [5]Pudu Veera Naveen Kumar

[1]Assistant Professor, [2 3 4 5] Student

[1]Electronics and Communication Engineering,

[1]Godavari Institute of Engineering and Technology, Rajahmundry, India

Abstract: This paper proposed IoT based solar powered water quality monitoring and purification of water. Nowadays we are facing water problems due to due to the pollution of water in rivers and lakes. So, to overcome this problem and to see if the water is good for using or not, we have thought about a certain system which can measure the quality of water and check whether it's useful or not. To examine the safe supply of water, the quality of water needs to be monitored in real time. In this paper we develop and design a system for real time monitoring for water monitoring using IOT (Internet of things). The proposed system consists of some sensors that are used to measure the parameters of the water. The parameters used in this system are conductivity, turbidity and pH value using solar panel and purification of water. The measured values can be processed by using ESP8266. Finally, the device information is shipped or delivered to web or cloud server using ESP8266 and Blynk Cloud.

Index Terms – ESP8266, pH, Turbidity, Conductivity, Solar Panel, Water Purifier, IoT.

I. INTRODUCTION

At present time there are a lot of inventions, as well as pollution and global warming is being formed because of the water quality is not good or not safe for drinking. At present time the water monitoring is a challenge in real time because of limited water resource, global warming and increase in population. Maintaining good water quality in rivers would benefit both humans and animals and it is play's an important role in the life's of a human as well as animals. Any imbalance or change in quality of water or water pollution may lead to health diseases to humans and simultaneously cause ecological imbalance to the species. So, our major priority is to give importance to water quality.

Water pollution remains a major factor which is declining ecological health in aquatic ecosystems worldwide. In India, the largest river Ganga, poses significant threats to human health and the larger environment. Severely polluted with human waste and industrial contaminants, the river provides water to about 40% of India's population across 11 states, serving an estimated population of 500 million people which is more than any other river in the world. Today, the Ganges is the fifth-most polluted river in the world.

The proposed system makes use of Internet of Things(IoT). The data of pH, Turbidity and Conductivity sensor can be seen on Blynk IoT platform through the ESP8266 and Wi Fi connectivity as well as the data can be seen on the 16*2 LCD display connected with the ESP8266. The data of all sensors can be stored on the blynk IoT platform so that it can be seen latter or it can be used for any other purpose. Whatever is the data coming from sensors can be seen from all over the world by using the concept of IoT. If the water is dirty and not drinkable, then it will be passed through the water purifier attached with the concept. During filtration, the

clear water passes through filters that have different pore sizes and are made of different materials (such as sand, gravel, and charcoal). These filters remove dissolved particles and germs, such as dust, chemicals, parasites, bacteria, and viruses. Activated carbon filters also remove any bad odors. The whole concept is operated by solar panel and lithium battery as backup power so the energy consumption can be minimized.
Water treatment plants can use a process called ultrafiltration in addition to or instead of traditional filtration. During ultrafiltration, the water goes through a filter membrane with very small pores. This filter only lets through water and other small molecules (such as salts and tiny, charged molecules).

II. RELATED WORK

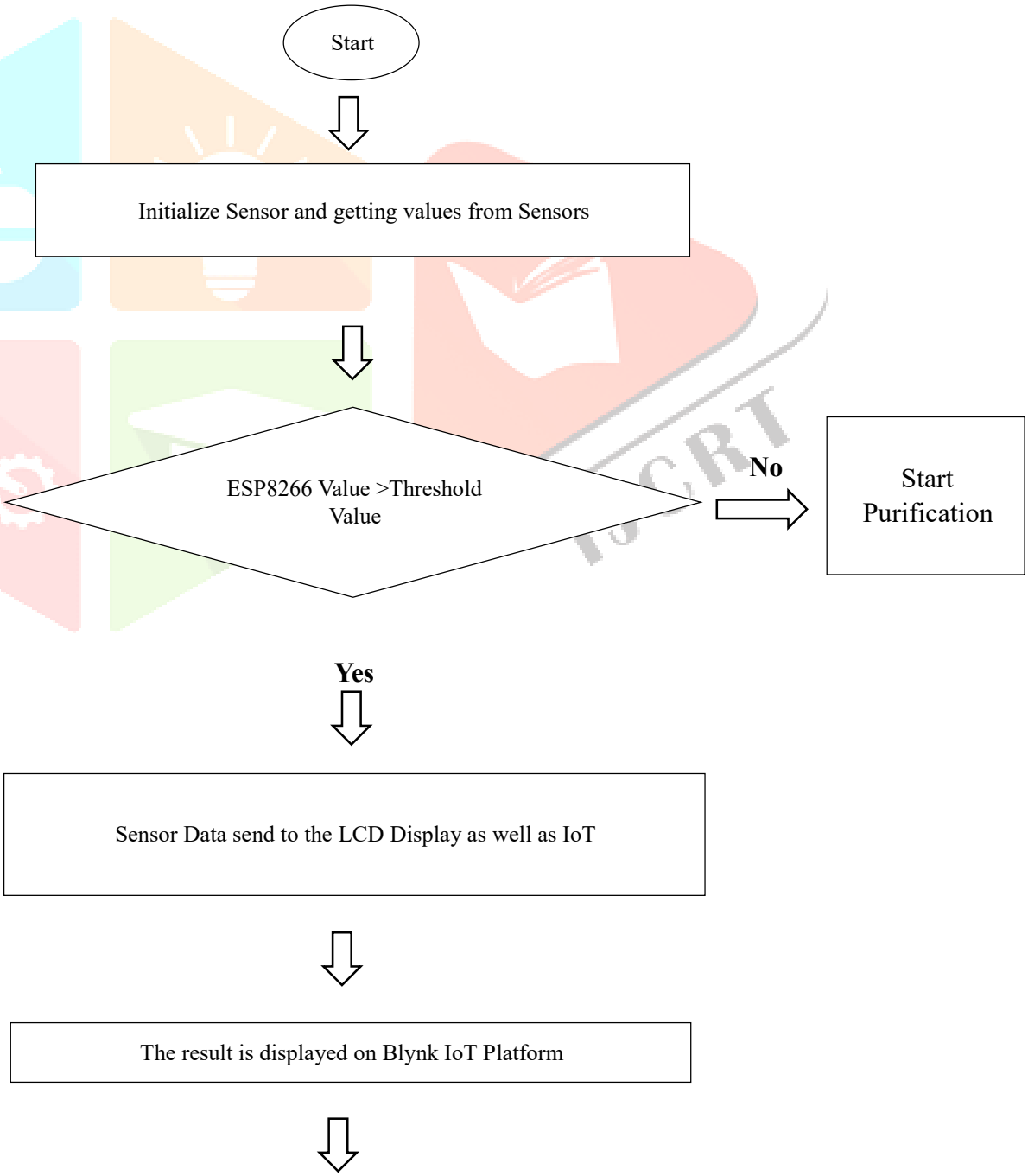
Pasika and Gandla et.al[1] proposed a monitoring system that employs multiple sensors for measuring diverse water quality parameters, including turbidity, pH, tank water level, environmental dampness, and water temperature. These sensors are linked to the MCU, and subsequent data processing is carried out by the PC. To monitor the quality of water under test, the collected data is transmitted to the cloud via the IoT-based ThingSpeak application.
Santosh Konde and Dr.S.B.Deosarkar.et.al[2] introduced a model for creating a Smart Water Quality Monitoring (SWQM) system, featuring an adaptable sensor interface device within an Internet of Things (IoT) environment. The model incorporates sensors, an FPGA board, and a Zigbee-based wireless communication module. Real-time evaluation of six water quality parameters (Turbidity, pH, Humidity, Water level, Water temperature, and CO2 on the water surface) is facilitated by this comprehensive setup.
Varsha Lakshmikantha, Anjitha Iriyanagowda, Akshay Manjunath, and Aruna Patted et.al[3] introduced a methodology for developing an IoT-based water quality monitoring system. This system aims to measure water quality through four distinct parameters: pH sensor, turbidity, water quality, and more. The connection of sensors to the Arduino Uno facilitates the sensing of water quality parameters.
M. Mukta, S. Islam, S.D. Barman, A.W. Reza, M.S. Hossain Khan.et.al[4] Proposed Iot based smart water quality monitoring system. This paper represents an IoT (Internet of things) based smart water quality monitoring (SWQM) system that aids in continuous measurement of water condition based on four physical parameters i.e., temperature, pH, electric conductivity and turbidity properties. Four sensors are connected with arduino-uno in discrete way to detect the water parameters. Extracted data from the sensors are transmitted to a desktop application developed in NET platform and compared with the WHO (World Health Organization) standard values. Based on the measured result, the proposed SWQM system can successfully analyze the water parameters using fast forest binary classifier to classify whether the test water sample is drinkable or not.
M.K. Amruta, M.T. Satish.et.al[5] Proposed Solar powered water quality monitoring system using wireless sensor network. The idea of 'Underwater Wireless Sensor Network' (UWSN) is the basic building block of a water quality monitoring using wireless sensor network (WSN) technology powered by solar panel. To monitor water quality over different sites as a real-time application, an excellent system architecture constituted by distributed sensor nodes and a base station is suggested. The nodes and base station are connected using WSN technology like Zigbee. Design and implementation of a prototype model using one node powered by solar cell and WSN technology is the challenging work. Data collected by various sensors at the node side such as pH, turbidity and oxygen level is sent via WSN to the base station. Data collected from the remote site can be displayed in visual format as well as it can be analyzed using different simulation tools at base station. This novel system has advantages such as no carbon emission, low power consumption, more flexible to deploy at remote site and so on.
K.A. Unnikrishna Menon, D. P., M.V. Ramesh.et.al[6] Proposed Wireless sensor network for river water quality monitoring. Coal continues to be mined in over 50 countries. Coal accounts for approximately 64% of India's electricity. Spontaneous explosions in the coal mines are one of the most common accidents. The main cause for mine explosions is the presence of toxic methane gas in an environment with insufficient oxygen. Gas detection is crucial for explosion prediction. Currently gas monitoring in coal mines is not so reliable. This paper introduces the use of a wireless sensor network (WSN) with gas sensors to predict methane outbursts in coal mines. This research work has developed an Early Warning System (EWS) deployment in the complicated environment of mines as low cost and power efficient wireless sensor network nodes have been designed to substitute the traditional wired and fixed monitoring equipment. The system can thus reduce the impact of mining explosions by facilitating the timely evacuation the miners from the areas of highest risk by providing an early warning and alarm system. Special attention has been paid to the WSN power

optimization design strategies that include: using low power components, only sending the minimum amount of data (with efficient data acquisition protocols and data aggregation protocols), appropriate configuration of nodes (with clustering protocols) and automatic timely variation of power consuming states (with state transitions of listening, sleeping and transmitting modes).

S. Geetha, S. Gouthami.et.al[7] Proposed Internet of things enabled real time water quality monitoring system. Smart solutions for water quality monitoring are gaining importance with advancement in communication technology. This paper presents a detailed overview of recent works carried out in the field of smart water quality monitoring. Also, a power efficient, simpler solution for in-pipe water quality monitoring based on Internet of Things technology is presented. The model developed is used for testing water samples and the data uploaded over the Internet are analyzed. The system also provides an alert to a remote user, when there is a deviation of water quality parameters from the pre-defined set of standard values.

III. EXISTING SYSTEM

We have made this project by looking one of the systems which was already implemented by liebelium smart water device. The system monitors certain parameters like pH, electro conductivity, Oxidation/reduction potential and temperature. They have connected the device to cloud to monitor the obtained data in real time which provides a fast and effective values.



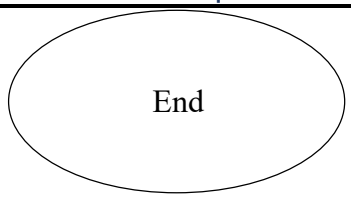


Fig 1: Flow diagram of Model

IV. PROPOSED SYSTEM

Our proposed system consists of three sensors they are pH sensor, Conductivity sensor and Turbidity sensor. ESP8266 access the sensor data and send the data to the Blynk IoT platform as well as display. First of all the pH , turbidity and conductivity is measured by our proposed model and the value is compared with the threshold value set in the program, if the values is less than threshold value then the water is considered for the water purification and the real time values are send to the display as well as blynk IoT platform.

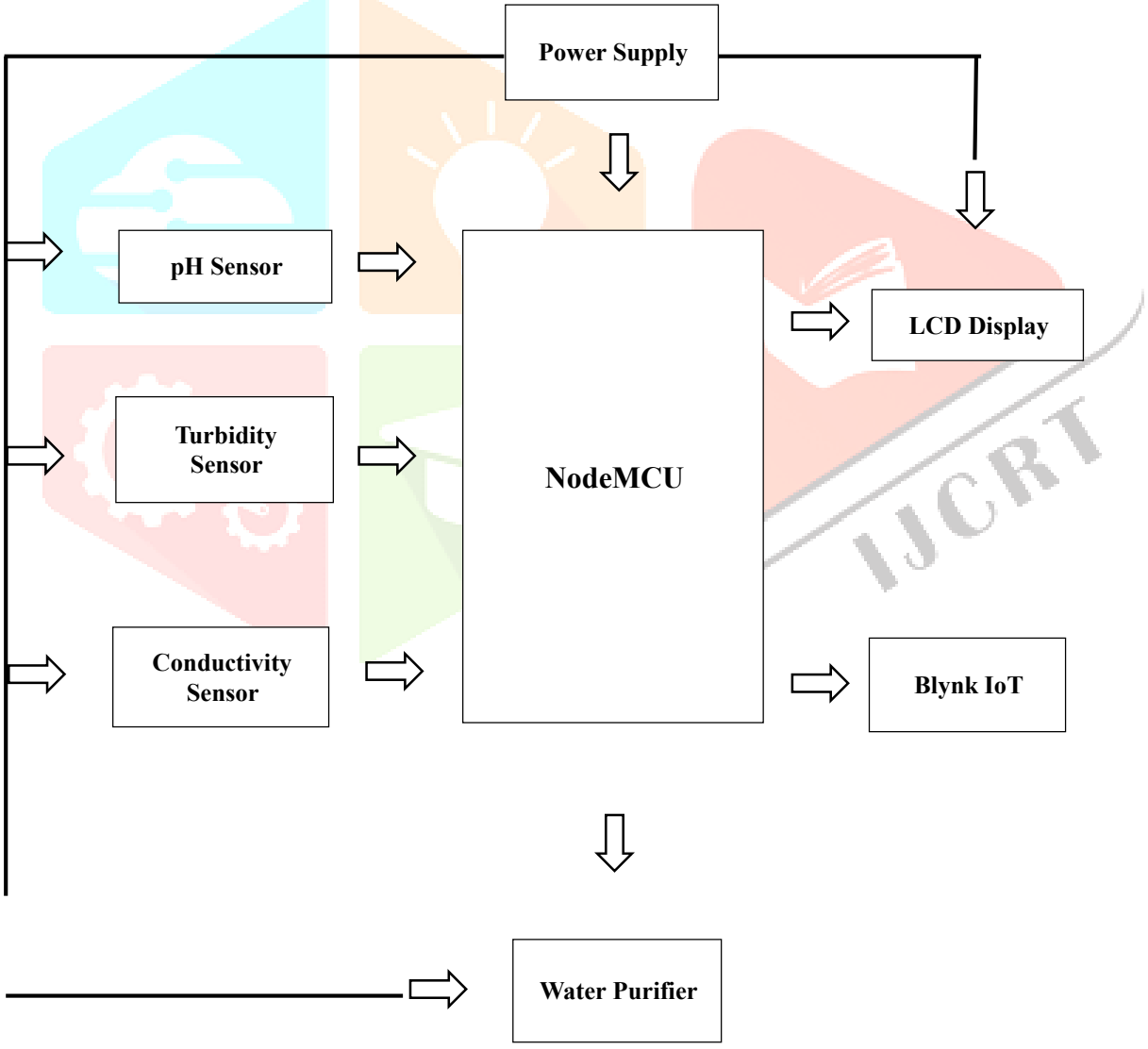


Fig 2: Block diagram of Proposed System

4.1. pH sensor:

The pH sensor measures the pH value from the range of 0-14. less than 7 it indicates acidic solution and more than 7 it indicates alkaline or basic solution. Each type of pH sensor has different specifications to measure the quality of the water. The pH value of water can help determine the quality of water. Measuring the pH value can also provide indications of pipe corrosion, solids accumulation, and other harmful by products of an industrial process.

FIG 3: PH SENSOR

4.2. Turbidity sensor:

It helps to calculate the amount of semi-solid particles present in water.Turbidity sensors are mainly used in wastewater and effluent measurements, river and stream gaging, sediment transport research, and laboratory measurements, control instrumentation for settling ponds. The value of turbidity sensor mostly measured in Formazin Nephelometric Unit (FNU), Formazin Turbidity Unit (FTU), Nephelometric Turbidity Unit (NTU).

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FIG 4: TURBIDITY SENSOR

4.3. Conductivity sensor:

Conductivity sensor is used to measure how much electric current can pass through in the solution. Conductivity measurements are mostly used in industrial applications as a simple and inexpensive or less cost way to control the ionic content in a solution. The conductivity is monitored at different stages of the process in water purification systems.

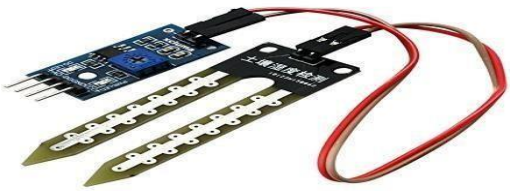

FIG 5: CONDUCTIVITY SENSOR

v. RESULTS AND DISCUSSION

In this system we had taken three samples of water.

1)Mineral water 2)Muddy water 3)Tap water

Results of 3 types of water sample

	pH Value	Turbidity (NTU)	Conductivity (uS/cm)
Mineral Water	7.4	10	754
Muddy Water	6.5	74	1276
Tap Water	7.2	13	987

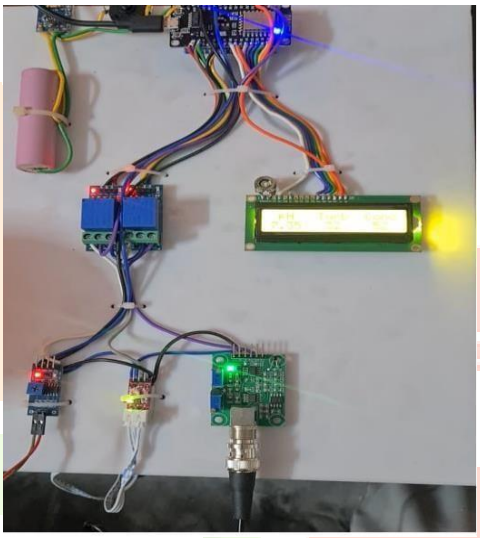

FIG 6: HARDWARE MODEL

Dirty water is purified through the water purifier using filtration method as shown in the below diagram.

FIG 7: WATER PURIFIER

The IoT values are shown as in the gauge graph shown below. These measured values can be observed from anywhere in the world.

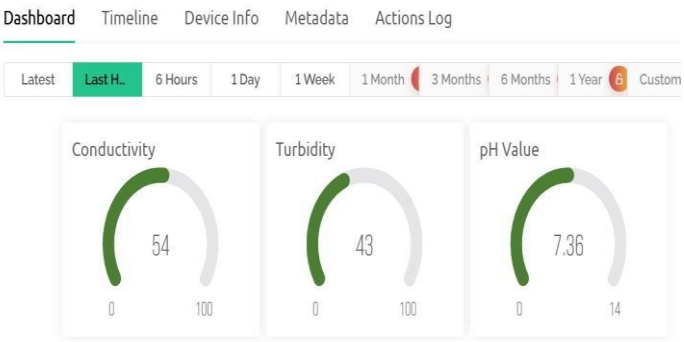

FIG 8: BLYNK IOT PLATFORM

In this figure the sensors value are directly shown on the led display. First is pH sensor value second is Turbidity sensor value and third is conductivity of the water.

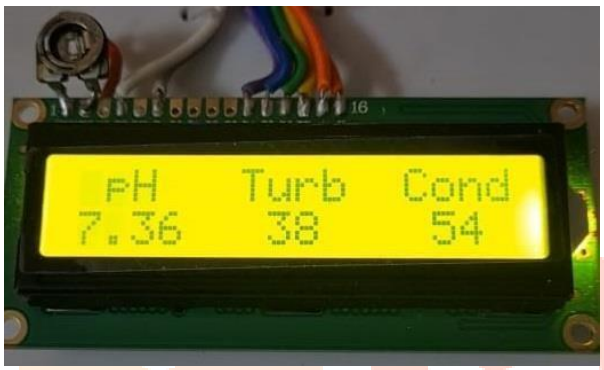

FIG 9: DISPLAY VALUE OF SENSOR DATA

VI. CONCLUSION

Based on the study of available water quality monitoring system, by the scenario of water we can say that proposed system is more suitable to check the water quality parameters in real time. This system introduces wireless sensor networking using several sensors to measure water quality, and Wi-Fi module which make sensor network simple and more efficiently. Furthermore, to monitor data from all over the world IOT environment is provided using Arduino for creating gateway and also, cloud or web computing technology such as Thing speak is used to monitor data on the internet. Therefore, the system will be faster and more efficient in real time and user friendly. Thus, we can fulfill the aim and objective of the proposed system.

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