ISSN: 3049-0952
www.jsetms.com

IOT BASED SOLAR POWERED WATER QUALITY MONITORING AND ITS PURIFICATION

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Abstract **The The A new conception for Solar Base a water purification and electrical IoT base monitoring system to fulfill the wants for clean water and electricity in one integrated, autonomous and efficient system is bestowed during this project. The sublimate water and power receiver contain 2 devices one is the charge controller and the another is the voltage-current sensor. Then the battery is connected to the Arduino with another voltage sensor. The water purifier is connected to a battery to consume power for purifying the unpurified water.Using the water flow sensor for how much water purifies through the water purifierthe water flow sensor is connected to Arduino and also uses a pH sensor for the purified water pH measurement. If the water purifier level is not pure then the relay was on the solenoid valve for mixed purifier solution to purify the water which is purity by the purifier. All the sensors and relays are connected to the Arduino for processing all the data from the sensor. For the IoT monitoring system use the wifi, Blynk server, and mobile Apps. All processing data send to the web server for remote monitoring. purifier water is unsafe than having to get a notification for mixing the pH solution. Potential sites for Solar Power and water purification systems embrace both rural and urban areas. An initial analysis of this potential has been conducted for the development country case. This system work perfectly here got well power source from solar and a backup to the battery. Better to monitor pH solar voltage, battery charge, output voltage, output current, and how much water has been used.**

Keywords: ESP8266, pH, Turbidity, Conductivity, Solar Panel, Water Purifier, IoT.

I. INTRODUCTION

Water is the most fundamental and valuable resource in the world. Without water, life cannot be sustained [1]. It is used for direct and indirect uses. Direct use of water includes drinking, bathing, and cooking, while indirect use includes irrigation and industrial purposes. With the advancement of technology, industrialization, and population growth, the quality of water is degrading every day [2]. Water pollution is now a serious issue around the world. Water pollution is degrading our biodiversity. The farming sector is getting contaminated because of toxic waste mixing in the water [3]. Contaminated water increases the spread of diseases such as cholera, diarrhea, dysentery, hepatitis A, typhoid, and polio. Every year, around 8.29 lakh people die from diarrhea because of drinking contaminated water (WHO 2022). Biological, organic, and inorganic pollution have contaminated over 70% of India's surface water resources and a significant percentage of its groundwater supplies [3, 4]. Almost every river in India is now heavily polluted. The increasing demand for water for human usage, irrigation, and expanding industrial operations has highly impacted the water quality of rivers, i.e., decreasing flows in rivers and depleting water levels of subsurface resources [5]. In a study in 2015, the Central Pollution Control Board (CPCB) identified 302 polluted river stretches on 275 rivers in our country [6]. The pollution of these river stretches has been classified into five different priority classes. Among 302 river stretches, 34 fall under Priority Class (PC) – I. Similarly, 17 are in PC – II, 36 are in PC – III, 57 are in PC – IV, and 158 are in PC – V.

The description of priority classes (I-V) is summarized [6] in Table 1.1.

Priority Class – I	Grossly Polluted (BOD greater than 30 mg/l).
Priority Class – II	very polluted (BOD between 20-30 mg/l)
Priority Class – III	moderately polluted (BOD between 10-20 mg/l)
Priority Class – IV	Slightly Polluted (BOD between 6-10 mg/l)
Priority Class – V	Good (BOD between 3-6 mg/l

Table 1. Rapid urbanization, sewage disposal, fertilizer run-off, chemical waste disposal, and radioactive waste are all reasons for water pollution, but water can also be contaminated by natural pollution. Animal feces, volcanoes, dirt from storms and floods are all major sources of natural pollution. Fig 1. shows the dominance of water pollution against other pollutions in major Indian states [7].

Water obtained from various sources may not be pure and utilizable. To check the water is usable and harmless and to prevent the spread of any damage to consumers it is critical to continuously monitor water quality. Although there are many water monitoring and treatment policies available but most of them are lab-based, so these are effort-intensive, time-consuming, expensive, and do not provide real-time

ISSN: 3049-0952
www.jsetms.com

information. To accurately examine the water quality, samples should be collected on a regular basis over a long period of time as parameters may vary with different natural events. To observe the change in water parameters, systematic monitoring over a period of time is needed. An IoT system also needs to be designed to perform the monitoring remotely and efficiently

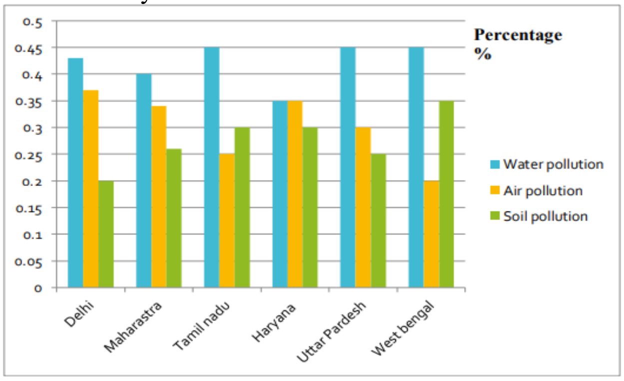


Figure 1. Water pollution dominance against soil and air pollution.

II LITERATURE REVIEW

Much Temperature: One of the most essential parameters that have a significant impact on aquatic life is temperature. Viscosity, palatability, solubility, odors, and other chemical reactions are affected by temperature. As a result, temperature influences the sedimentation, chlorination, and BOD processes. It also affects the biosorption of dissolved heavy metals in water. It is usually expressed in degrees Celsius, and a thermistor or thermometer is used to measure it [8].

Color: Decayed materials from both organic and inorganic substances add color to the water. The color of the water gives a general idea of the level of water pollution in that waterbody. Its value is calculated by comparing it to standard color solutions or colored glass discs [9].

Odor: Organic and inorganic compounds, or dissolved gases, can alter the odor of water. Like color, the odor can also provide information about water contamination. The odor value is calculated by comparing it with a sample of odor-free distilled water [10].

Turbidity: Turbidity describes the cloudiness of the water. It quantifies the ability of light to travel through water. Turbidity in water is caused due to suspended particles such as clay, dirt, organic matter, plankton, and other granular materials. Turbidity in drinking water is undesirable because it causes the water to appear discolored [11].

TDS: Solids in water exist in two states: solution and suspension. These two types of solids can be distinguished by bypassing a water sample through a glass fiber filter. The suspended solids remain on the filter's surface while the dissolved solids pass through with the water.

When a filtered fraction of a water sample is evaporated in a tiny dish, the solids that remain as a residue are referred to as total dissolved solids or TDS [12], [10]. Total solids (TS) are calculated as the sum of total dissolved solids (TDS) and total suspended solids (TSS).

pH: The pH of water indicates how acidic or alkaline it is. Between 0 and 6, the acidic range is found, and between 8 and 14, the alkaline range is found. The form of some chemicals can change by the change of the pH in the water. Therefore, it may affect other water quality parameters. The pH range of 6.5 to 8.5 is the most suitable [13].

EC: The property of a solution to carry or conduct an electrical current is measured by its electrical conductivity (EC). The greater the concentration of dissolved charged chemicals in water, the greater the electrical current that can be carried. It is not directly beneficial to water quality. However, it is more beneficial in terms of water's ionic content, which determines hardness, alkalinity, and some of the dissolved solids. It is determined using the electrometric method [13].

Alkalinity: Alkalinity is a measure of the ability of water to neutralize acids. This is known as water's buffering capacity, or the ability of water to resist a change in pH when acid is added. The alkalinity of water is primarily caused by the presence of hydroxide ions (OH-), bicarbonate ions (HCO3 −), carbonate ions (CO32−), or a combination of the two in water. High amounts of alkalinity in water may indicate industrial or chemical pollution. Alkalinity can also occur naturally. The acidity and alkalinity in natural waters provide a buffer action on acid wastes and protect fish and other water-living organisms from sudden changes in pH [13].applications.

III. METHODOLOGY

Because unable to produce RO Purifier kits quickly, purifiers in this system use pre-made purifier kits from the market. We'll put together the water filtering kit purifier kit. Solar energy is used to power this system. A 20W solar panel is used in this solar system. For backup power, the battery employs a 9Ah battery. In the event of bad weather or at night, this backup power is used. Since this system will be far from us, it won't be possible to watch the device move there every day. Therefore, we will pair this device with an IoT-based monitoring system that will display the device status. such as the PH of the water, solar energy, battery charge, device power usage, etc. Here, a PH level sensor is used to continuously measure the water's PH level. Here, we will apply a PH solution using remote IOT regulating if the Ph level falls below or rises over the desired level. Voltage and current sensors are used for Power Monitoring. We can calculate the number of solar-derived powers using current and voltage data. The amount of power required to run those systems is determined by device power measurement. Remove the amount that Manny Watt solar needs from this comparison. This approach also measures battery charge to determine how frequently the battery is recharged. Here Use Blynk, a third-party web server, for data control and monitoring because it is a quick server for those tasks. To aid with future study, this service uses graphs. The Arduino Controller is used by this system controller. Programming will be done in embedded C in this case

When the fundamental building blocks are close to becoming ideal, the accomplishments are seen to be close. The goal in this chapter was to construct structures that were as close to ideal as possible. This chapter mainly emphasizes the gap framework technique along with the block diagram and flowchart. This chapter's objective was to demonstrate the project's methodology and guiding principles. Through the examination of the system block diagram and flow chart, we have demonstrated that. The chapter also discusses how the flow chart and block diagram were analyzed

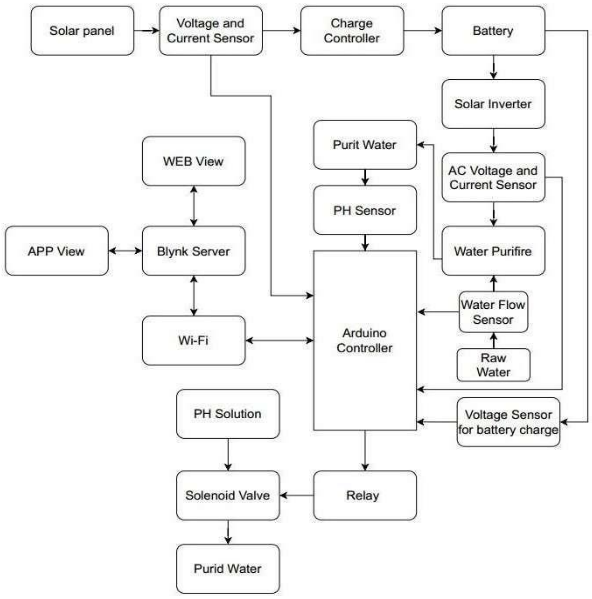
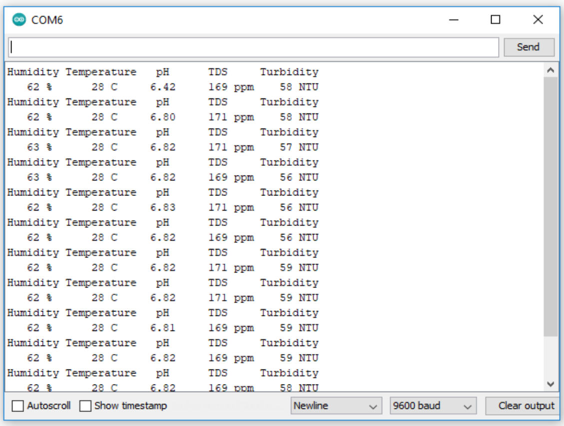


Figure 2 System Block Diagram

IV. RESULT

Any The sensors value in Arduino serial monitor have been shown in the figure 4



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•Figure 4 shows the same parameters values being updated in the ThingSpeak server.

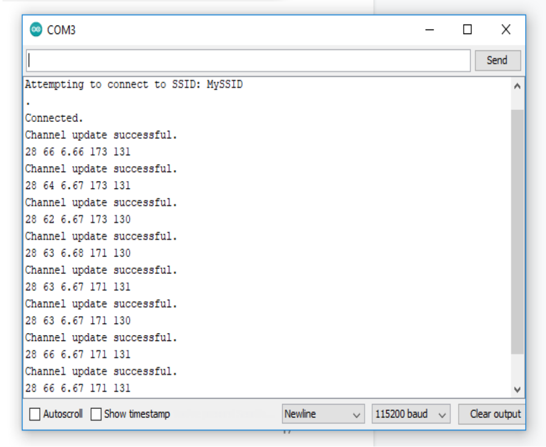
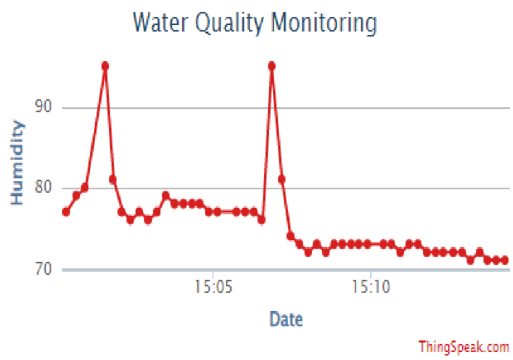


Fig 5. Parameter values on serial monitor

Fig.5 Updating parameter values in ThingSpeak server
The real time graphical representation of the parameters in the Thing Speak server has shown in Fig.4 ,5.



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V. CONCLUSION

Any type of biological or chemical dust that accumulates on the panel reduces the output power of solar photovoltaic cells by interfering with their performance. PV performance can be restored by removing the heavy layer of dust deposition. Therefore, maintaining and cleaning solar panels is a crucial part of their performance. An 8-panel array's efficiency has been seen to increase by 30% to 33%; thus, we can observe that it will be more useful in solar parks with significantly bigger cell counts. Thorough cleaning is very beneficial because even a single panel obstructed by dust can reduce the array's overall performance..Considering that the cells are connected in series, it is crucial that they all function at maximum efficiency. Both the natural technique and the manual way are now used to clean PV panels. Given the benefits and drawbacks of the various solar panel cleaning techniques now in use, it is believed that an automatic brush type system would be best because it uses either very little or no water to remove dust off solar panels. It may be developed domestically and is inexpensive as well. It functions as an

ISSN: 3049-0952
www.jsetms.com

auxiliary unit of the current solar photovoltaic system and is also in operation.

The Solar Panel Cleaning System project was designed to provide an effective solution for maintaining solar panel efficiency. The primary objective was to develop a machine capable of cleaning solar panels through an efficient control system. This prototype represents a step forward in an emerging market, despite various challenges encountered during development.The system demonstrated significant improvements, including a reduction in cleaning time (observed percentage reduction) and a 70% reduction in labor costs compared to traditional cleaning methods. By eliminating the inefficiencies of manual cleaning, this solution offers a more reliable and cost-effective approach.

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