"Multi-Purpose Water Management for Reverse Osmosis (RO) Dissipated Water"

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Abstract

In recent years, the increasing quantity of water purifier consumers is facing the problem that the Reverse Osmosis (RO) rate utilizes a lot of water to make less water drinkable. 75% of water is disposed of by 25% water. So, it can be used for other purposes rather than being wasted. Approximately 2430 Cr. Litres of water is wasted away per day in India. Reverse osmosis is the process of making water drinkable & changing everything with the Internet of Things (IoT).

Here we are using IOT and sensors to design a system that will collect RO wastewater or rainwater in one common tank and use it for watering grass in public infrastructure and washing vehicles. Raspberry Pi Pico is a smart board and an integral part of every design. The proposed design will help save clean water and prevent wasting water. This small setup will help initiate Atmanirbhar Bharat to develop a responsible society for Nature care & Resources.

In this work, the proposed system also helps to assess various parameters such as pH value, water quality monitoring using a pH sensor, soil moisture, turbidity sensor, temperature, and humidity in the RO dissipated water.

Keywords: IoT, microcontroller, reverse osmosis, sensors

INTRODUCTION

RO WASTEWATER REUSE USING IoT

Nowadays the crisis of water is too much high, so that reuse of wastewater is largest problem in current scenario. About 60% of raw water is converted into RO dissipated water and only 40% of water is used as treated water. So, there are very big difference, in which we observe that the RO dissipated considerable amount of water is directly thrown out in drainage and there is too much wastage of water that occurs in various places like industries, malls, household and in companies. So, the basically main problem is the wastage of RO reject water and we must find a resolution for that. Freshwater scarcity and the excessive consumption of water have been regarded as serious challenges over past decades. Several contributing factors such as an increasing population, improving living standards, agricultural sector growth, and industrialization have threatened a further reduction in the water level and given rise to this crisis. Based on the type of industry, a vast amount of wastewater containing salinity and organic compounds such as Arsenic, Fluoride Cadmium, Chromium, Mercury, Manganese, Lead, etc., have been produced.

Discharging these contaminant elements above their effluent standard has exerted catastrophic effects on aquatic and terrestrial habitats and human health. To address this issue, several treatment technologies have been investigated by scientists such as reverse osmosis, disinfection, granular filtration, gravity separation, coagulation-flocculation, air stripping and aeration ion exchange, adsorption, and membrane filtration. Among all the conventional techniques under study, the distillation process can be accuracy due to the potential benefits associated with the technology. And, in the rapid increase in industrial activities

during the last decades has caused severe changes in the environment. This development has led to contaminants such as heavy metals nutrient ions and dyes.

Mining, mineral processing, and metallurgical operation generate a considerable amount of polluted water containing toxic heavy metals, which are almost persistent and non-degradable in nature in turn cause adverse effects in the environment. Therefore, the treatment of these waste waters becomes necessary before being discharged into the environment and river water streams, respectively. Accordingly, in life of the facts, treatment of RO reject water, heavy metals containing industrial effluent become quite necessary before being discharged into the environment.

Objectives:

- The main objective is to provide automated solution for RO water reuse.
- Automated process for sprinkling the water in houses and also for washing cars and utensils.
- Water quality and tank level monitoring using sensors.
- Update Sensor value to IOT.
- Notification message is sent to authorized person.

Methodology:

- When the Ro's start operation, firstly system will check level of storage tank
- If the level of the tank is level then it pumps the water to storage tank
- Then if the storage tank is full then water will be pumped to plants at gardens
- Even the water is pumped through solenoid valves for car washing purpose
- Final option will be pumping the water to back to tank in case it's not required by all three areas like kitchen storage, vertical gardens and car washing mechanisms.
- Water quality monitoring using pH sensor and Turbidity sensor
- The sensor values are updated through the Wi-Fi to the ThingSpeak.

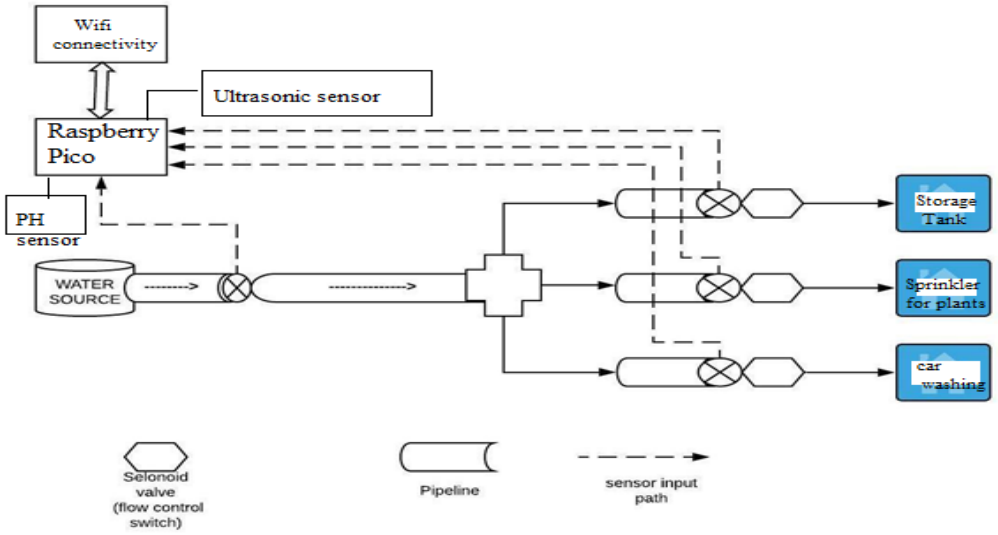

Figure 1.1: Proposed Methodology.

System Architecture:

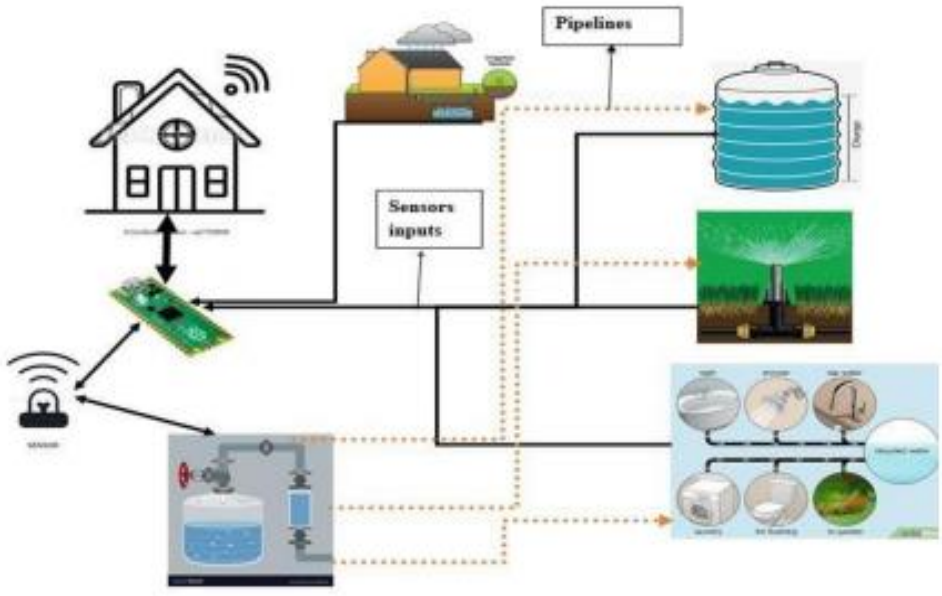

Figure 1.2: System Architecture

Result

We improve the existing monitoring system and combine LCD image processing technologies with water quality monitoring to improve our system's applicability, accuracy, and reliability. In particular, we use the adaptive optical adjustment module to effectively balance the illumination and compare various moving target detection techniques to eliminate the influence of complex backgrounds. The IoT-Based Smart System (IBSWS) is an innovation in the step towards using RO wastewater as useful water and conserving water by implementing IoT concepts using sensors and microcontrollers (Raspberry Pi pico) over a network to facilitate communication and efficient action.

With IoT as its backbone, the IBSWS uses a turbidity sensor to check water flow in the tank, an ultrasonic sensor to check the water level in the tank, temperature, and a humidity sensor to check the temperature and the measure of water vapor present in the tank, soil moisture sensors to accurately measure and compare the moisture of the soil to a threshold value to ensure that the soil is watered only when the plant needs it. Additionally, if the pH sensor checks the pH of the water being given to the soil is unsafe for the plant the IBSWS uses the Blink platform on IoT to communicate to Raspberry Pi pico microcontrollers which use plant-healthy acid and base pH solutions and indicates the pH of the water to the user before being given to the plant.

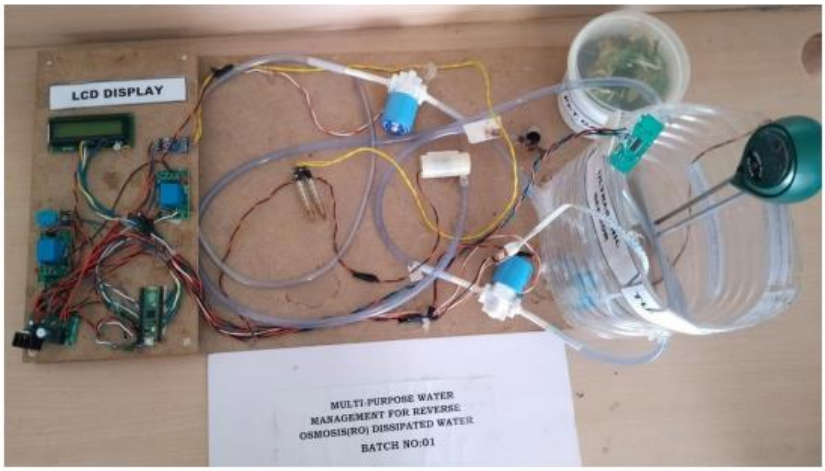

Figure 2.1:Multi-purpose Water Management for Reverse Osmosis (RO) Dissipated water Model.

The system can be managed by the user via the Thinks Speak app created using the Blink program, which allows the user to select the type of plant that they are watering so that the system can accurately manipulate the pH of the water given to the plant. The user interface can also be used by the user to monitor the pH, temperature, turbidity, humidity, and moisture levels monitored by the system. From the experimental evaluation results, it can be concluded that such a system can be used autonomic and efficiently to water specific crops. Overall, the system acts as an efficient method to conserve water by reducing human error and increasing efficiency in terms of large- scale. In the future, the authors hope to conduct a long-term test on several different plants to monitor the true percent water savings that can be saved by using the IBSWS, while also tracking the effect of using IBSWS on plant and water.

Figure2.2: Model Setup Working with Team

Innovation in the Project:

Proposed design will help save Clean dissipated water. Also, the small setup will help to initiate Atmanirbhar Bharat to develop a society for Nature care & resources. In this work, the proposed system uses several sensors to measure various parameters such as pH value, the turbidity in the water, level of water in the tank that helps in multipurpose usage at residential and industries.

Conclusion and Further work

Freshwater scarcity and the excessive consumption of water have been regarded as serious challenges over past decades. Several contributing factors such as an increasing population, improving living standards, agricultural sector growth, and industrialization have threatened a further reduction in the water level and given rise to this crisis. Nowadays the increasing quantity of water purifier users is facing the problem that the Reverse Osmosis (RO) rate consumes a lot of water to make less water drinkable. 75% water is disposed of by 25% water. It will also use that 75% for other purposes rather than wasteful. Approximately 2430 Cr. litters of water are wasted per day in India. Reverse osmosis is the process of making that water drinkable & change everything with IOT. Here using IOT and Sensor to design a system that will collect RO wastewater from homes in one common tank and use it for watering grass in public infrastructure and vehicles washing.

We can apply the same process with Rain water harvesting at residential places and utilize for general purpose such as air conditioners, fountains etc.