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# *RO WASTEWATER MANAGEMENT USING SMART DRIP IRRIGATION AND WATER QUALITY MONITORING USIN*

***Aravind M, Charan M J, C P Omkar Rawath, Anurag Appaji Patil, Sougandhika Narayan***
***Student, Student, Student, Student, Assistant Professor, Department of Computer Science and Engineering***
***K S School of Engineering and Management***

***Abstract*:- Portable water is essential to life for humans. Water bodies such as lakes and rivers are the main providers of water. Water that has been moved around may leak or get contaminated thereafter, which might hasten the development of illnesses that are carried by water. We utilize Internet of Things (IoT) sensors to monitor conductivity, pH, TDS, salinity, and other characteristics in order to evaluate the appropriateness of the RO system's output water for human consumption and to evaluate its purity. RO systems produce a an abundance of non-portable water as a byproduct that is good for use at home. We are using Internet of Things sensors to use water rejected by RO systems for drip irrigation.**

**Keywords:-IoT, RO systems, Sensors based irrigation systems**

## I. INTRODUCTION

The issues that technology for monitoring water quality in real time are currently confronting include population expansion, global warming, and scarce water resources. Improved techniques for tracking water quality indicators are therefore needed. The pH scale, which quantifies the concentration of hydrogen ions in water, is a water quality metric. Water temperature may impact the toxicity and solubility of some substances. Water clarity is measured by Total Dissolved Salts (TDS), which is the total quantity of dissolved salts and minerals plus turbidity.

Applying precise quantities of water to crops to improve harvests is referred to as drip irrigation. In earlier times, irrigation was done manually using conventional methods, however this method showed to be unproductive. Smart drip irrigation system has been created by fusing IoT and other innovative technologies with traditional irrigation methods. The design of sophisticated water quality monitoring systems is crucial for a number of reasons. First, it makes it possible to detect toxins in water sources early on. It is essential for assuring the water supply's safety. Second, these systems provide current information on indicators of water quality, facilitating quick action to stop the spread of illnesses that are contracted via contact with water. Additionally, in order to safeguard natural ecosystems, regular water quality monitoring is needed. Additionally, smart water quality monitoring systems help businesses and water utilities comply with requirements by giving precise and up-to-date data on water quality parameters.

Because they precisely moisturize plant roots, smart drip irrigation systems could keep water wastage to an absolute minimal. These systems use sensors and modern technology to monitor soil moisture levels, weather, and crop requirements. Smart drip systems save energy and reduce the need for manual labor by using real-time data for automated watering. Precisely providing the roots with water and nutrients speeds up the growth and development of plants, hence enhancing crop quality, yield, and total agricultural

production. Furthermore, smart drip irrigation systems reduce the negative environmental consequences of excessive water consumption and chemical discharge by using only the essential amount of nutrients and water. Farmers may enjoy increased flexibility and convenience by remotely monitoring and controlling irrigation systems using a computer interface or mobile app. Irrigation schedules may be dynamically adjusted by smart drip systems in response to shifting plant development phases, soil moisture contents, and weather patterns. Smart drip irrigation technologies ensure farms remain profitable while also encouraging appropriate water management practices and minimizing environmental effects. These factors contribute to the long-term sustainability of agriculture.

## II. TERMINOLOGIES

**Reverse Osmosis System**: The RO system is an advanced water purification technology designed to remove impurities and contaminants from water. These systems work on the principle of selectively allowing the passage of water molecules while blocking the passage of unwanted substances.
**Internet of Things (IoT)**: IoT refers to an interconnected network of physical devices with sensors, software, and network connections that enable the collection and exchange of data.
**IoT in Agriculture**: IoT has emerged as a revolutionary technology in the agricultural sector. This refers to the integration of smart devices, sensors, and communication technologies to collect and analyze data. Connecting devices improves decision-making, improves resource management, and ultimately increases revenue.
**Sensor Devices**: sensor devices play an important role in today's technology-driven world as they enable data collection from the physical environment and facilitate a variety of applications.
**IoT Platform**: The Internet of Things (IoT) Platform is a comprehensive software solution that enables seamless integration, management, and communication of connected devices within an IoT ecosystem.

## III. LITERATURE REVIEW

Reverse Osmosis (RO) wastewater is the byproduct resulting from the RO filtration process, aimed at purifying water by eliminating contaminants and impurities. Employing a semi-permeable filtration membrane, the RO technology effectively separates dissolved salts and other impurities from the water. Despite its purification capabilities, the RO filtration method generates a significant amount of wastewater for every volume of purified water produced. Unfortunately, this rejected wastewater is often disposed of into drainage systems and left unused.

In today's era, RO filtration has become necessary in households and for commercial applications. Many individuals manually inspect their RO purifiers, using devices like TDS meters to detect any fluctuations. However, a substantial number of users lack the knowledge of proper device usage and assume that all parameters are within acceptable ranges. This oversight may impact the longevity and efficiency of the RO membrane due to prolonged usage without maintenance. To address this issue, we propose a solution involving the implementation of quality parameters on the display, along with the utilization of IoT sensors. These sensors collect data on various quality parameters, notifying users regularly and sending alerts to their mobile phones.

Through IoT automation and the integration of sensors such as pH sensors, TDS sensors, and Turbidity sensors, fluctuations in water quality can be detected and promptly communicated to users or authorities. This ensures timely servicing and maintenance, with the frequency determined by factors such as water type and membrane functionality. Our IoT-Water Quality Monitoring System is presented(IoT-WQMS) for domestic use, utilizing various sensors to collect data. This data is then processed by machine learning algorithms, providing output on whether the water meets the required quality parameters. Additionally, by transferring collected data to ML algorithms via an 8-bit MCU-based card (ESP8266), ML approaches may be used for monitoring the quality of water.

In the context of agriculture, efficient water use is crucial for promoting crop development and maximizing yields, particularly in regions facing water scarcity. Smart drip irrigation, enhanced by sensor technology such as moisture sensors, humidity sensors, and water flow sensors, facilitates real-time data gathering for efficient irrigation. We emphasize the importance of scheduling irrigation times and highlight the feasibility of solar-powered systems for cost savings and simplicity of implementation.

Expanding on this idea, we propose the integration of RO wastewater into smart drip irrigation systems to enhance water efficiency and agricultural productivity. Farmers can remotely monitor and control the irrigation system through mobile applications or web interfaces, ensuring optimal water usage. Using IoT sensors, we monitor water usage, preventing overflow or drought conditions that could foster the growth of unwanted weed plants. Our system incorporates an ESP32 microcontroller, solenoid valve, soil moisture sensor, humidity sensor, and water flow sensor. The Blynk IoT mobile app and web development dashboard facilitate data collection and enable users to toggle automatic irrigation on or off. Moreover, we introduce the cost-effective and wifi-enabled ESP32 for real-time data access and improved irrigation management.

## IV. CONCLUSIONS

Reverse osmosis wastewater treatment, intelligent drip irrigation systems, and water quality monitoring, taken together, offer an all-encompassing and environmentally friendly approach to agricultural water usage. This creative approach successfully tackles issues with resource conservation, environmental impact, and water shortage.

By precisely supplying the right quantity of water to the plants, the technology reduces water waste and increases agricultural yields while cutting expenses and water bills. The efficiency of this strategy is further increased by integrating farmer information distribution with real-time data collecting. Reverse osmosis water quality monitoring devices, which guarantee that water satisfies quality requirements and is free of pollutants, also constitute a significant advancement in assuring water safety.

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