Aqua Loop

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Abstract- *Water scarcity is becoming a major global concern due to rapid urbanization, industrial growth, and climate change. At the same time, large amounts of wastewater generated from domestic, commercial, and industrial sources are discharged without proper reuse. This project focuses on the design and implementation of an efficient filtration system to treat wastewater for reuse in air conditioning (AC) systems. Air conditioning units require significant amounts of water for cooling towers, condensers, and heat exchange processes. Instead of using fresh potable water, this project proposes the use of treated wastewater after removing impurities such as suspended solids, dissolved salts, microorganisms, and organic contaminants. The treatment process includes multiple filtration stages such as sediment filtration, activated carbon filtration, membrane filtration (RO/UF), and optional UV sterilization to ensure water quality meets operational standards. The system is designed to reduce freshwater consumption, minimize environmental pollution, and lower operational costs. Water quality parameters such as pH, turbidity, Total Dissolved Solids (TDS), and microbial content will be monitored before and after filtration to evaluate performance. This project demonstrates a sustainable and cost-effective approach for water conservation in HVAC systems and promotes environmentally responsible engineering practices.*

Keywords: Water Purifier, Water Cooler,Water Pump

I. INTRODUCTION

Water scarcity is becoming a serious global issue due to rapid urbanization, industrial growth, and population increase. Large amounts of wastewater are generated every day from households, industries, and commercial buildings. Most of this wastewater is discharged into the environment without proper reuse, causing pollution and wasting valuable water resources. Air conditioning systems, especially in large buildings, consume a significant amount of water for cooling purposes in cooling towers and heat exchange systems. Using fresh water for air conditioning increases water demand and operational costs. Therefore, treating and reusing wastewater for air conditioning can be an effective and sustainable solution. This project focuses on filtering and treating wastewater so that it can be safely reused in air conditioning systems. The treatment process may include physical filtration, sedimentation, chemical treatment, and biological processes to remove impurities, suspended solids, harmful chemicals, and microorganisms. After proper treatment, the recycled water can be used for cooling applications without affecting system performance. Reusing treated wastewater helps conserve fresh water, reduce environmental pollution, lower operational costs, and promote sustainable water management. This project aims to develop an efficient, economical, and environmentally friendly wastewater filtration system for air conditioning use.

II. PROBLEM IDENTIFICATION

1. Problem Statement

Today many houses use **RO water purifiers** for drinking water. These purifiers produce a large amount of **reject (waste) water**.

- For **1 liter of pure water**, about **2–3 liters of water is wasted**.
- This reject water is usually **drained into sewage or thrown away**.
- At the same time, devices like **air coolers require a large amount of water**, especially during summer.

Due to this:

- A **large quantity of water is wasted every day**.
- There is **inefficient use of water resources**.
- Water scarcity problems increase in many areas.

Therefore, a system is required to **reuse the rejected water instead of wasting it**.

2. Proposed Solution

The **Aqua Loop system** is designed to solve this problem by **recycling RO reject water and using it in an air cooler**.

In this system:

1. The **waste water from the RO purifier is collected** in a storage tank.

2. The water **passes through filtration units** such as:
    - Sand filter
    - Carbon filter
    - Mesh filter
3. These filters **remove dirt, particles, and odor** from the water.
4. The **filtered water is supplied to the air cooler tank**.
5. The cooler **uses this water for cooling through its pump and cooling pads**.

This creates a **closed loop water reuse system**, called **Aqua Loop**, where water is **not wasted but reused efficiently**.

3. Result of the Solution

- Reduces **RO waste water loss**
- Saves **large amount of water**
- Provides **water for air cooler operation**
- Creates a **low-cost and eco-friendly solution**

III. OBJECTIVE

- **To reduce water wastage produced by RO water purifiers.**
- **To reuse RO reject water by filtering it and using it in an air cooler.**
- **To develop a zero waste water utilization system that recycles water effectively.**
- **To design a simple and low-cost filtration system for household use.**

IV. WORKING PRINCIPLE

- **Collection of Waste Water**
  The **reject water from the RO water purifier** is collected in a **storage tank** instead of being wasted.
- **Primary Filtration**
  The collected water first passes through a **mesh or sediment filter** to remove dust, sand, and large particles.
- **Secondary Filtration**
  The water then passes through a **carbon filter or sand filter** to reduce impurities, odor, and small particles.
- **Water Transfer to Cooler**
  After filtration, the **cleaned water is supplied to the air cooler tank** using a pipe connection or a small pump.
- **Cooling Process**
  The **cooler pump circulates this water over cooling pads**. When air passes through the wet cooling pads, **evaporation takes place**, which reduces the air temperature and produces cool air.

V.ADVANTAGES

- Water Saving Aqua loop system reused treated wastewater, so fresh water consumption becomes less.
- Environment Friendly
- Cost Saving It reduces water wastage and helps in protecting the environment. Reusing water reduces the cost of fresh water supply and wastewater disposal.
- Continuous Water Supply Treated water can be reused again and again for different purposes.

VI. FOLLOWING ARETHEMAIN COMPONENTS OF AQUA LOOP

1. Water Purifier
2. Water Cooler
3. Water Pump
4. Electric Motor
5. Base frame
6. Nut & Bolt

1. Water Cooler

2.Water Purifier

3. Stand


4.Water Motor

VII. CONCLUSION

The Aqua Loop system is an effective and eco-friendly solution to reduce water wastage from RO water purifiers. In this project, the reject water produced by the purifier is collected, filtered, and reused in an air cooler instead of being discharged as waste.

By using a simple filtration process, the waste water becomes suitable for cooling purposes. This system helps in saving a large amount of water, especially in households where RO purifiers and air coolers are used regularly.

The Aqua Loop system is low cost, easy to install, and environmentally friendly. It promotes the concept of water conservation and efficient resource utilization. Therefore, this project can be widely used in homes, hostels, offices, and small industries to reduce unnecessary water wastage and support sustainable water management.

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