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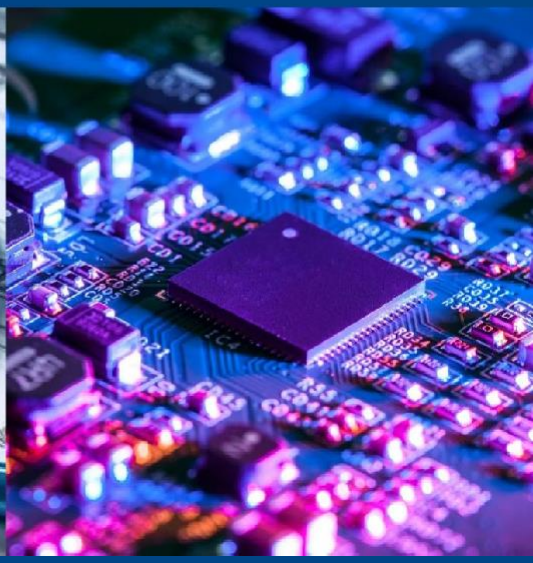

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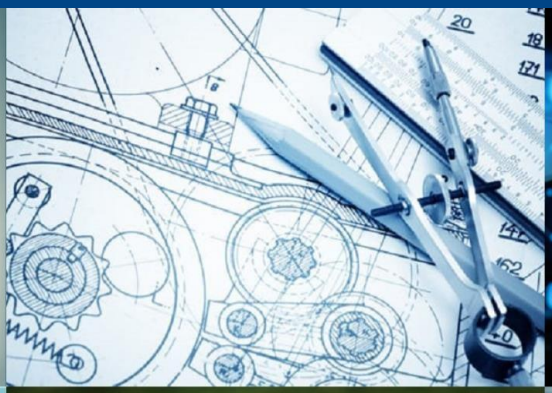

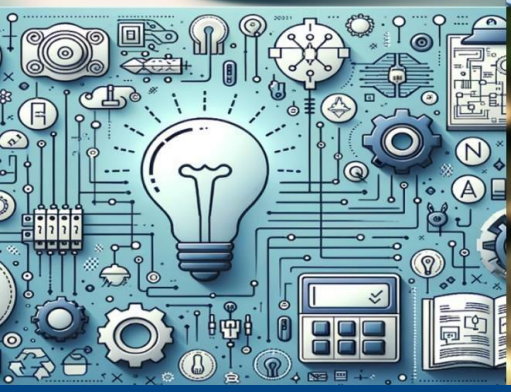

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Organized by

Mookambigai College of Engineering, Keeranur, Tamil Nadu, India

Multilayer Gravitational Greywater Filter for Smart Cities

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ABSTRACT: The graywater reuse systems that are eco-friendly have been made necessary as the scarcity of water becomes severe and the demand for domestic water rises. A gravity filtration unit that is multilayered and has no cost for electricity and is low-priced is introduced in this project for using at home.

The system utilizes ecofriendly materials, that is, coconut fiber, activated charcoal, moringa seed powder, and crushed corn cob to get rid of turbidity, suspended solids, colour, odour, and organic impurities from the domestic greywater. The efficiency of the filtration process is reached by using several methods together such as physical filtration, adsorption, natural coagulation, and decay of organic pollutants. The water after treatment can be used for non-potable needs like watering the garden, flushing toilets, and cleaning floors. The adoption of this solution cuts off the freshwater resource dependency and encourages the decentralized, sustainable water reuse that is in line with the smart and eco-friendly urban development.

KEYWORDS: Greywater Treatment · Natural Filtration Media · Smart Water Reuse · Low- Cost Filter · Gravitational System · Sustainable Water Technology

I. INTRODUCTION

Water scarcity and limited access to safe freshwater have raised the need for sustainable water reuse technologies. Domestic greywater makes up a large part of household wastewater that often goes untreated. This project aims to design a gravity-based natural greywater filtration system that uses low-cost biodegradable filtration materials for non-potable applications like irrigation and toilet flushing.

Scope of the Project

- Design and build a zero-energy greywater filtration unit
- Choose and prepare eco-friendly filtration materials
- Evaluate performance in reducing turbidity, color, and odor
- Suitable for households, rural areas, and peri-urban settings
- Future work: IoT-enabled monitoring and modular systems

Objectives

- Create a biodegradable and cost-effective greywater system
- Assess the efficiency of natural filter materials:
- Coconut fiber – sediment removal
- Activated charcoal – adsorption
- Moringa seeds – coagulation and antibacterial action
- Corn cob – reduces organic matter and turbidity
- Lower suspended solids, turbidity, and organic contaminants

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II. METHODOLOGY

1. Select greywater source
2. Prepare and activate media
3. Fabricate filter column
4. Assemble layers
5. Conduct testing and quality analysis
6. Evaluate performance

Material Study

- Coconut fiber – a porous and biodegradable sediment filter
- Activated charcoal – adsorbs dissolved impurities
- Moringa seeds – serve as a natural coagulant and antimicrobial agent
- Corn cob – traps organic matter and aids in bio-filtration

III. RESULTS & DISCUSSION

We observed a significant reduction in turbidity. The system effectively removed odor and color. It operates entirely on gravity and is affordable and scalable for both rural and urban areas.

Cost Analysis

- Filter Housing - ₹1000
- Coconut Fiber - ₹100
- Activated Charcoal - ₹600
- Moringa Seed Powder - ₹150
- Crushed Corn Cob - ₹240
- Total Cost ≈ ₹2100

IV. CONCLUSION

This eco-friendly filtration system decreases freshwater use and supports decentralized water reuse. It offers a sustainable solution for households and aligns with smart city goals.

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