SMART GREYWATER TREATMENT AND REUSE SYSTEM FOR GREEN BUILDING SOLUTIONS.

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College : Jain College Of Engineering, Belagavi
Branch : Master Of Computer Applications
Guide(S) : Dr. Praveen Banasode
Prof. Sonal Patange
Student(S): Ms. Pooja Pradhan
Ms. Priyanka M Channappanavar
Ms. Parvathi Salimath
Mr. Veeresh

Keywords:

Greywater, Greywater Treatment, IoT-based Monitoring, Filtration Systems, Water Quality Sensors, Sustainable Water Systems, Urban Water Management.

Introduction:

Greywater constitutes a significant portion of residential wastewater and, when properly treated, can be reused for non-potable purposes like toilet flushing, landscape irrigation, and cleaning. Traditional greywater reuse systems, however, often lack automation, real-time monitoring, and adaptive functionality, which can lead to inefficiencies and potential health risks.

To overcome these limitations, the integration of smart technologies in greywater treatment has gained significant attention. A Smart Greywater Treatment and Reuse System combines advanced filtration, sensors, Internet of Things (IoT) devices, and automation to ensure efficient, safe, and user-friendly water recycling within buildings. This approach not only reduces freshwater consumption and wastewater discharge but also contributes to achieving the goals of green and sustainable building design.

This project explores the development and implementation of a Smart Greywater Treatment and Reuse System tailored for green building solutions. By integrating smart technology with eco-friendly practices, this system aims to optimize water usage, enhance resource efficiency, and promote environmental sustainability in modern infrastructure.

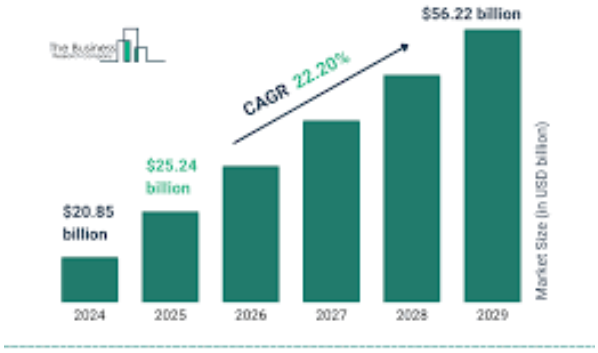

Figure 1: Smart Greywater Treatment And Reuse System For Green Building Solutions.

Objectives:

- Automated Filtration: To Implement an automatic filtration system that activates when turbidity exceeds reuse standards.
- Efficient Storage: To Design a system to store filtered greywater safely for reuse.
- Controlled Distribution: To Automate the distribution of recycled water using pumps and relays.
- Sustainability: To Ensure the system promotes sustainable reuse of water with minimal manual intervention.

Methodology:

- Define system requirements for greywater recycling.
- Identify and select sensors (e.g., turbidity sensor) and actuators (pumps, relays).
- Install turbidity sensors in the greywater input section.
- Calibrate sensors to measure water quality thresholds accurately.
- Design filtration units (e.g., mechanical and chemical filters).
- Integrate filtration units with the sensor output to activate when turbidity levels exceed thresholds.
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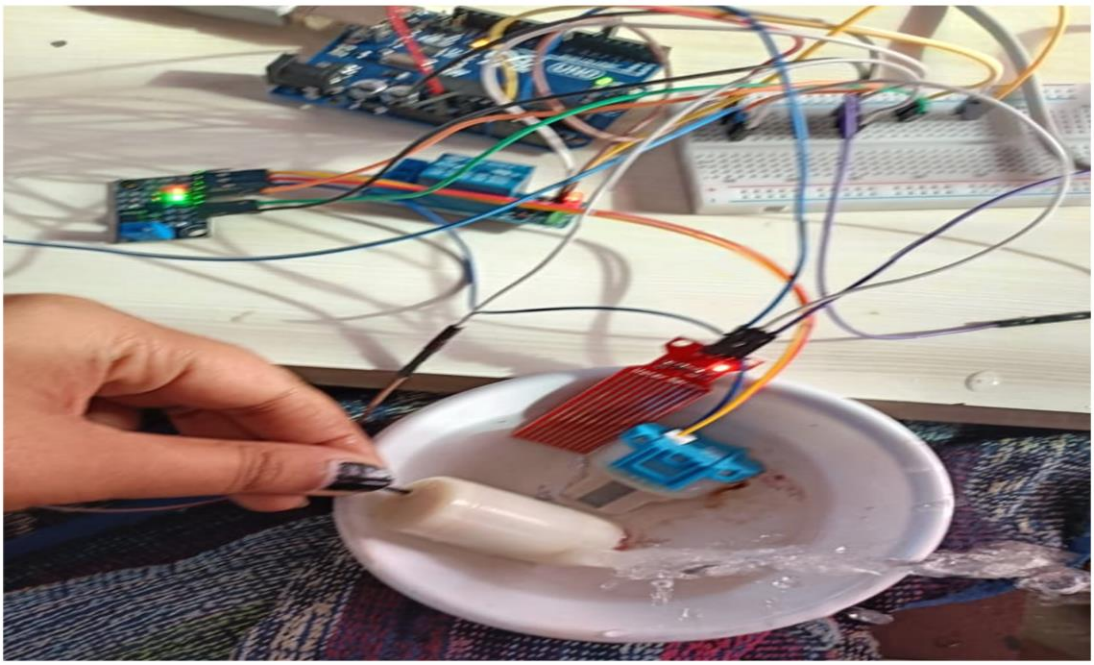
- Use a microcontroller (e.g., Arduino Uno or Raspberry Pi) for data acquisition and processing.
- Program the microcontroller to interpret sensor data and trigger appropriate actions (e.g., activate filtration, pumps).

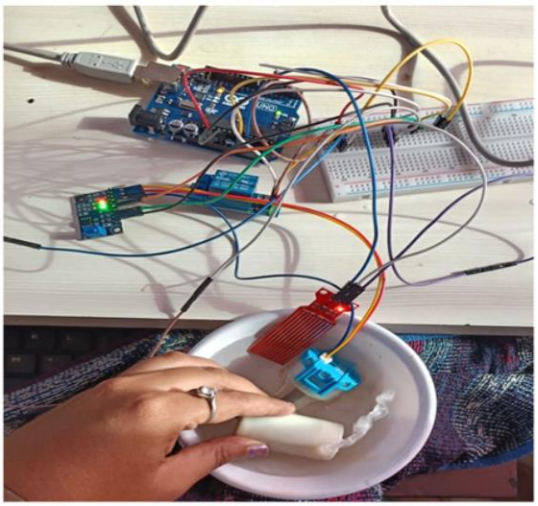
Result and Conclusion:

- In conclusion, Effective Greywater Recycling: Successful treatment of greywater to meet reuse standards by automatically monitoring and filtering water based on turbidity levels.

- Automation and Efficiency: Reduced manual intervention through automated monitoring, filtration, storage, and distribution processes.
- Water Quality Assurance: Continuous real-time monitoring ensures the recycled water meets predefined quality thresholds.
- Sustainable Water Use: Recycled greywater is effectively reused for purposes such as irrigation, cleaning, or flushing, reducing dependency on fresh water.

Outcomes





Future Scope:

1. Smart Monitoring – IoT and AI enable real-time water quality checks and system optimization.
2. Urban Scalability – Easily integrated into smart cities and high-rise buildings.
3. Expanded Reuse – Treated greywater can be reused for more applications beyond flushing and irrigation.
4. Wider Reuse – Suitable for irrigation, flushing, and cleaning.
5. Eco-Friendly – Reduces freshwater use and wastewater discharge.