

Greywater Treatment for Household Reuse

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Abstract: Grey water can be defined as any home wastewater produced, excluding sewage. Grey water has a diverse composition reflecting the way of life of the occupants and the chemicals they use in their homes. The environment is conducive to bacterial growth, implying that before being re-used, it must be treated. Organic contaminants, heavy metals, pathogens, and other microorganisms are among the other treatment goals. The most frequent treatment method is to filter grey water through biofilm systems. Mulch beds for direct application near to the crops or trees are an alternative to watering the entire area. The samples were characterized on the basis of turbidity, electrical conductivity, pH and dissolved solids. Unions are used throughout the connection to enable separation and reconnection of the pipe work. A sand filter was made using one of the tanks as well as a UV light bulb for disinfection. This study helped to recycle/reuse grey water for big gardens, edible plants like fruits and vegetables. In drought prone areas the grey water management served as a boom. Water is the most fathomless and abundant resource on earth, it is the most lavishly used by humans, it covers 75% of the world yet very limited part of water is useable to us because more than 90% is salty sea water and frozen in glacial and polar ice caps thus the need to recycle grey water. Therefore, the need for this study. The purpose of this research is to reduce the use of fresh water which can help reduce demands on public water supply. It can help reduce the amount of wastewater entering sewers.

Keywords: Greywater, Treatment, Sorption, Organic contaminants, waste water

I. INTRODUCTION

Urban agglomerations import large volumes of clean water to cater the water needs of their increasing populations and produce large volumes of wastewater and storm water that together, are quickly evacuated, decontaminated and disposed of, usually into rivers or lakes. Within this context, new approaches are emerging to achieve a more sensible and sustainable management of existing water resources (Domened and Sauri, 2010). Rainwater, greywater and desalinated sea water are considered to be good alternative resources. Rain water harvesting is one of the most useful options of water conservation but it has some limitations such as it is only useful for areas receiving good amount of rainfall throughout the year. On the other hand, seawater desalination results in increased emission of CO₂ and other pollutants to the atmosphere and causes disturbance to the adjacent marine environment. Hence, greywater reuse is a viable option that can be very useful in water arid and semi-arid areas. There are variety of system designs from simple to sophisticated systems designed according to quality and type of reuse. This paper presents a review of some of the systems.

Grey water can be defined as any home wastewater produced, excluding sewage, is referred to as grey water [1]. The organic loading is the major distinction between grey water and sewage (or black water). When compared to grey water, sewage has a substantially higher organic content. Grey water has a diverse composition [2-3]. Considerably, reflecting the way of life of the people occupants and the chemicals they use in their homes for laundry, bathing, and cleaning etc. Grey water has a variety of contaminants. significant amounts of organic material that degrades quickly, such as fat and ten sides, as well as oil from frying and soap residues, among other things other types of detergents Pathogens are virtually exclusively found in the human body [4-5]. If faeces are present, the grey water component is contaminated. Nonetheless,



the grey water. The environment is conducive to bacterial growth, implying that before being re-used, it must be treated. When compared to mixed wastewater, the nutritional level of grey water is often low (sewage). Phosphorus (P) concentrations might be high in some circumstances, whereas nitrogen concentrations are always low. If people only used P-free detergents, the P concentration might be lowered to levels lower than those seen in advanced treated wastewater, reducing this step in the processing before reuse [4, 6]. Although metals and organic contaminants are normally low in greywater, they can rise if environmentally dangerous compounds are added to the wastewater. Metals come from the water itself, the pipe system's corrosion, and the cutlery and shampoos used in the home. Many common household compounds, such as shampoos, glues, preservatives, and cleaners, include organic pollutants [6-7]. People can also have a significant impact on the content of grey water in this scenario. For the collection and transportation of grey water, a pipe system is required. Because of this, thinner pipes can be used than in a traditional mixed wastewater system. Toilets do not need to be transported Waste [8-9]. In order to avoid congestion, the pipes should be installed in order to remove the grease. Grey water is relatively unharmed to the environment and hygiene standards [10-11]. Small and local issues are common. However, due to the high amounts of easily degradable chemicals, grey water can be a major source of odour if not adequately controlled.

II. MATERIALS & METHODS

These five types of lithium-ion battery have various electrochemical performances due to the adoption of different chemical materials. In this section, the comparisons of their structure, nominal voltage, energy density, high current rate capability, thermal stability, cyclability and safety performance are presented.

A. Study Area and Greywater Sampling

LMO This study was conducted at Afe Babalola university, Ado Ekiti. A clean of one-liter plastic bottles was used for collecting gray water from central drainage of laundries, bath house and cafes around the university. Sampling was collected once a week for four weeks before testing for selected parameters. structure [25].

B. Greywater Characterization

The samples was characterized on the basis of turbidity (AMTAST AMT27 Turbidity meter), electrical conductivity (EC) (VWR CO310 meter), pH (OAKTON pH 700 meter), total dissolved solids (TDS) (VWR CO310 meter). All instruments were calibrated before use. All measurements were also conducted in replicates.

C. Greywater Treatment Systems Construction and Operation

During the construction of the graywater treatment chamber the following materials were purchased: carbon filter, cotton filter, paper filter, pressure gauge pipe, sand water filter, tanks, pipe, tank one open, cover, pump-centrifugal, elbows, alkaline filter, UV light, 2-way switch, back nut, gasket, water sprinkler, valves, union, tap head, double threaded nipple.

III. METHODOLOGY

The following steps were taken for the experimentation process.

- (i) Holes were made on the tanks for connection of pipes with the use of heat and a metal pipe
- (ii) With use of a back nut, double threaded nipple, elbows, pipe, unions, valves the connection was made. The back nut is used to hold the double threaded nipple to the tank, while the other end of the nipple is connected to the pipe. Unions are used throughout the connection to enable separation and reconnection of the pipe work, valves were put between each tank to control to flow of water [14].
- (iii) A sand filter was made using one the tanks. The filter was made by first adding cotton then fine sand then activated carbon then gravel and plebes. Sand is used for the removal of suspended matter, as well as floating and drinkable particles. Activated charcoal helps improves water clarity, diminishes unpleasant odors, and removes chlorine. Cotton is used to stop sand particles from leaving the filter [15].



- (iv) A water sprinkler was put into one of the tanks for aeration. Aeration is the process of bringing water and air into close contact in order to remove dissolved gases, such as carbon dioxide, and to oxidize dissolved metals such as iron [16].
- (v) A UV light bulb was put into one of the tanks for disinfection. UV light provides rapid, effective inactivation of microorganisms through a physical process [17-18].
- (vi) A final tank was connected for storage
- (vii) A tank was connected to a pump for back washing of the aeration tank, disinfection tank and the storage tank.

IV. RESULT & DISCUSSION

A. Water Quality Analysis

Water quality analysis for grey water was conducted prior to the treat and the following parameters were measured and recorded, turbidity, pH, total dissolved solid (TDS), salinity and conductivity and the results obtained as well as the result of the treatment process are presented in Tables 3 & 4. Water quality analysis was carried out after the water treatment process in order to be able to compare the results with the previous water quality analysis.

Table 1: Pre-Treatment Water Quality Results

S/N	Locations	Tests				
		Turbidity	Ph	TDS	Salinity	Conductivity
1	Boys Hostel 2	516 fnu	8.4 (alkaline)	9.63 mg/l	11.41 psu	19.28 μ s/cm
2	Laundry	854 fnu	10.94(alkaline)	12.71 mg/l	15.47 psu	25.4 μ s/cm
3	Smoothy Shack (cafe)	88.7 fnu	7.3 (alkaline)	1424 mg/l	1.49 psu	2.87 μ s/cm
4	Girl's hostel	697 fnu	8.5 (alkaline)	1232 mg/l	1.26 psu	2.46 μ s/cm
5	Boys hostel 1	270 fnu	10.2 (alkaline)	681 mg/l	0.65 psu	1379 μ s/cm

Table 2: Post-Treatment Water Quality results and their comparison to required water quality standard

S/N	Locations	Tests					Nigerian Drinking Water Standard	
		Turbidity	Ph	TDS	Salinity	Conductivity	Test	Maximum Preferred Quality
1	Boys Hostel 2	-	6.7	267	376	529	Ph	8.5
2	Laundry	-	7.1	278	414	654	TDS	327
3	Smoothy Shack (cafe)	-	6.6	205	270	456	Salinity	500
4	Girl's hostel	-	7.3	281	443	558	Conductivity	728
5	Boys hostel 1	-	6.9	235	396	487	Turbidity	0.9

Results obtained showed in Table 1 & 2 that there was a general reduction in alkalinity of the water after treatment as compared with the pre-treated water samples. There was also a sharp reduction in TDS values for all water samples



retrieved from the various locations. Basically, the treatment of the grey water samples resulted in an improved condition of the water samples validating its abilities for a reuse.

V.CONCLUSION

Water is the most fathomless and abundant resource on earth, it is the most lavishly used by humans, it covers 75% of the world yet very limited part of water is useable to us because more than 90% is salty sea water and frozen in glacial and polar ice caps thus the need to recycle grey water. With the help of this grey water treatment chamber the amount of grey water that has and will be recycled for irrigation or domestic use has greatly increased and the amount of grey water that in our environment is reduced, reducing environmental pollution and wasted pure water.

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