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Reuse of Grey Water for Flushing Purpose

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ABSTRACT

Grey water is the wastewater that is being discharged from a house, excluding black water (toilet water). This includes water from showers, bathtubs, sinks, kitchen, dishwashers, laundry tubs, and washing machines. It generally contains traces of soap, shampoo and toothpaste, food scraps, cooking oils, detergents and hair in minor quantities. Grey water makes up the largest proportion of the total wastewater flow from household in terms of volume. Typically, 50-80% of the household wastewater is grey water. If a composting toilet is also used, then 100% of the household wastewater is grey water. Studies in different countries have estimated that the usable domestic grey water resource could amount up to 35% of the total domestic demand. Non-domestic establishments such as swimming pools, restaurants, hotels, schools, and other public buildings produce clean grey water. This grey water can be collected before it goes to the septic tank or the municipal wastewater system, and may be reused to irrigate plants after providing a simple treatment. With a little additional treatment, this water can also be used for toilet flushing and other applications. Some safeguards are required.

Keywords: Grey Water, Toilet Flush, Sand Filter, Onsite Reuse, Gravity Flow System

I. INTRODUCTION

Grey water is the wastewater that is being discharged from a house, excluding black water (toilet water). This includes water from showers, bathtubs, sinks, kitchen, dishwashers, laundry tubs, and washing machines. It generally contains traces of soap, shampoo and toothpaste, food scraps, cooking oils, detergents and hair in minor quantities. Grey water makes up the largest proportion of the total wastewater flow from household in terms of volume. Typically, 50-80% of the household wastewater is grey water. If a composting toilet is also used, then 100% of the household wastewater is grey water. Studies in different countries have estimated that the usable domestic grey water resource could amount up to 35% of the total domestic demand. Non-domestic establishments such as swimming pools, restaurants, hotels, schools, and other public buildings produce clean grey water. This grey water can be collected before it goes to the septic tank or the municipal wastewater system, and may be reused to irrigate plants after providing a simple treatment. With a little additional treatment, this water can also be used for toilet flushing and other applications. Of course, some safeguards are required. The risks to the human and plant health should be minimized. In certain cases, no treatment may be required. The Ministry of Environment and Forests norms for environment clearance to construction projects is 100% treatment of grey water by collecting grey and black water in separate pipelines and reusing it for irrigation or flushing. But there are no recommendations for separating household grey water in India. The knowledge of the state of the art technologies adopted in grey waste water management in households in

other countries can help in utilizing the reuse potential of it.Sometimes kitchen water and laundry water are not included in grey water due to the presence of oil and greases in kitchen water and surfactants in laundry water which may decrease the efficiency of the various physical and biological treatment techniques.

II. METHODOLOGY

The greywater is recyclable and with proper treatment can be put to reuse in toilet flushing. The data collection and processing water use – includes greywater from flushing and face/ hand washing, mopping, utensils washing etc. is done on the basis of actual consumption. The treatment unit is made potable and thus the units adopted in this project is such that it could be accommodated in small space provided for the entire unit. The equalization tank and sand filtration method is adopted here with various locally available materials such as sand of various sizes, gravel of different sizes, charcoal, brick pieces and sponge.Parallel pipeline networks are made to collect the greywater and direct it to the treatment unit where it enters the equalization tank prior to sand filtration. Parallel pipeline networks are provided to check that the waste water is being sent to the treatment plant during the maintenance period of the greywater recycling system. The outlet and the inlet of the system are provided with check valves so as to direct it to the next floor inlet or outlet in case of overflows. The effluents are made to flow through gravity to the immediate lower floor toilet flush through well connected pipe network. It is to be noted that no additional or extra energy is needed as input in any stage for the operation of this treatment unit.

III. RESULTS AND CONCLUSION

For India's future generations to be ensured of a reliable water supply, sustainable management practices must be implemented to preserve the nation's declining groundwater resources. The present study reviews and suggests the concept of using greywater in various possible fields and thus, making fresh water demand with in control. The use of grey water in India is in the stage of infancy. In India, this greywater system may be very effective in the school /college campuses especially those with residential facilities. The method experimentally assures to be effective water conservatory method cutting off the fresh water usage up to 10 to 30%. It also reduces load on the treatment plant and saves the energy used for such large scale treatments. The experimental trials were conducted in the laboratory with different materials and varying depths and the most efficient method was adopted. The comparison of the parameters of the untreated and the treated water is as shown in the table.This is also a reliable and sustainable method made handy and thus can be easily adopted in any floor of the building.

The method also is the solution for the water crisis which is one of the major crisis in present day and in future in India. Proper maintenance and improved public awareness can make this decentralized system more effective and convenient by reducing transportation cost and pressure on centralized recycling systems. Therefore, a novel wastewater treatment and reuse strategy has been proposed which suggests the separate treatment of greywater. Greywater can be treated by onsite treatment processes unlike black water which can be treated as centralized system. This treatment system can be implemented at household or cluster level so that recycling system needs to be robust and simple to operate.

Table 1

Test	Observation before passing filtration unit	Observation after passing filtration unit	Permissible Limit
pH	6.9	6.7	6.5-8.5
Total Hardness	323	451	600 mg/l
Alkalinity	1068	616	600 mg/l
Colour	10	<1.0	10 CFU
Odour	Disagreeable	Agreeable	Agreeable
Turbidity	102	3	5 NTU
BOD_5	72	30	2-50 mg/l
TSS	1200	700	1-1000 mg/l
Total Phosphorous	Absent	Absent	Absent
Chloride	404	390	500 mg/l
Sulphate	300	150	400 mg/l

From this analysis it can be concluded that seasonal fluctuation is a great problem in utilizing demand management, rain water and storm water harvesting as alternative supply options of water resources. For this reason using these alternative options is not always reliable. In contrast, grey water recycling is more reliable source in order to manage the rising demand of water. Reliability reduces water demand throughout the year and also reduces volumes of waste water to be treated are the major advantages of grey water recycling process. Thus the greywater is purified in site and reused for toilet flushing and in turn contributes in decreasing the water demand to a certain extent in the present water scarce scenario.

IV. SCOPE OF FUTURE WORK

This treatment unit being handy can be adopted in any kind of building and can be specially designed depending on the location, water demand and disposal method and the quality of greywater generated in the building. This method serves the best in the multi-storey residential buildings where lots of greywater generates in site. In such locations this treat unit can effectively treat the waste water avoiding extra load on the septic plants and conserving water at the same time. This method can also be developed as a separate unit of treatment for kitchen wastes alone by necessary additions in the filter media depending on the quality of the kitchen waste water generated in the building. Based on the type of the building for which the unit is being adopted, the treatment unit can be effectively designed as per the water quality of the greywater generated there.

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