Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 04, April-2020

Grey Water Filter Module for Household

A Small Scale Domestic Waste Water Filtration Technology

Asst. Prof. Mayur A. Jirapure[1]
Civil Engineering Department
Jawaharlal Darda Institute of Engg. & Tech,
Yavatmal-445001, (MH) India

Mr. Pranay P. Surana[2]
Civil Engineering Department
Jawaharlal Darda Institute of Engg. & Tech,
Yavatmal-445001, (MH) India

Mr. Varad Joshi[3], Mr. Shyam Shire[4], Mr Vivek Ade[5]
Jawaharlal Darda Institute of Engg. & Tech,
Yavatmal-445001

***Abstract*—The work is related with grey water filtration. The objective behind this project is to develop a practice of grey water filtration and reuse of it for different purposes in house work only. This project will help to reduce the wastage & generation of grey water respectively. Instead of wasting this grey water into sewers and increasing load on municipal sewer (if they are in existence) and in STP and also were there are less source of drinking water (like river or streams) in the area (urban, rural) this filter module which is merely made of easy available natural filter material (like sand, red brick pieces, jute mesh, etc) and from economical point of view, it is a re-step towards sustainable development.**

Keywords*—STP (Sewage treatment Plant), grey water, module; red-brick pieces

I. INTRODUCTION

This article main objective is to develop a practice and setup a trend for reusing the grey water by filtering it in and use it for day to day life work. As in developing country like India, today also India faces water crises & drought. Urbanization is at the peak due to increasing human population and as the population increases demand water is also increases. About 42% of India's land area is facing drought, with 6% exceptionally dry--four times the spatial extent of drought last year, according to data for the week ending March 26, 2019, from the Drought Early Warning System (DEWS), a real-time drought monitoring platform. Andhra Pradesh, Bihar, Gujarat, Jharkhand, Karnataka, Maharashtra, parts of the North-East, Rajasthan, Tamil Nadu and Telangana are the worst hit. These states are home to 500 million people, almost 40% of the country's population [1]. As freshwater is fast becoming a scarce resource, it's high time India takes grey water recycle and reuse seriously. In order to meet the growing water demand, two sustainable options are available – desalination and wastewater recycle and reuse. As wastewater from houses categorize in black water (generated from toilets) not easily treatable due to bacteria, pathogen contain & greywater (generated from sinks, showers, washing machines and bathtubs) is treatable as it contains salts & some percentage of heavy metals due to chemicals.

A. Understanding Greywater

Greywater is generated from sinks, showers, washing machines and bathtubs. About 133 liter (35 gallon) water is generated per person per day. The content of the greywater varies by the source (means kitchen, laundry or bathroom) and the country. The amount of organic material is much lower compare to blackwater from toilets but the amount of heavy metals are about the same. Almost all the inorganic materials are manmade & synthetic substances which include soaps, bleaches, detergents, shampoo, etc.

B. Characteristics of Greywater

The quality of greywater depends on the source from which it is drawn as well as the use to which this water is put, but there are general characteristics that apply to greywater (Carden *et al.* 2006). Greywater can be divided into two categories based on pollutant loads: high pollutant load and low pollutant load (Friedler 2004). According to Li (2009), greywater generated from household kitchens and those from the laundry are higher in organics and physical pollutants compared to bathroom and mixed greywater. Various factors, such as the number of residents in a household, age distribution, living standard, residents' cultural habits and the quality of the water supplied to the household, may have an influence on the greywater characteristics and result in a wide variation in the quality of greywater generated from different households and from various sources within a household (Morel & Diener 2006).

II. METHODOLOGY

We have made a filter module consisting of layers of different filter media in a plastic module (container) as shown in figure (1). Module (container) is made of a simple plastic jar and is divided in to five compartments i.e. aggregate layer, sand layer, coal layer, resin layer and brick layer. Aggregate layer with depth of 8.70cm, Coal layer with depth of 6.70cm, Sand layer with depth of 27.30cm, Resin layer with depth of 1.30cm and Brick layer with depth of 1.90cm with a freeboard of 0.8 cm Then we are going to pour the water sample from top side of the jar and water will pass through filter different media in trickling action. There is outlet/ tap at bottom of jar from were filtered sample will be collected for laboratory analysis. The sample results will be then tally to the discharging of wastewater norms of Govt. approval authority.

A. Greywater Sampling

This study sampled and assessed the physical and chemical properties of greywater generated from the kitchen and wash basin sources (in mix form). Samples of greywater

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 04, April-2020

source were collected from 01 house over a week. Grab samples were collected once a day. Samples were collected directly from the the manual washing areas or wash basins while the kitchen water was collected from the kitchen sink.

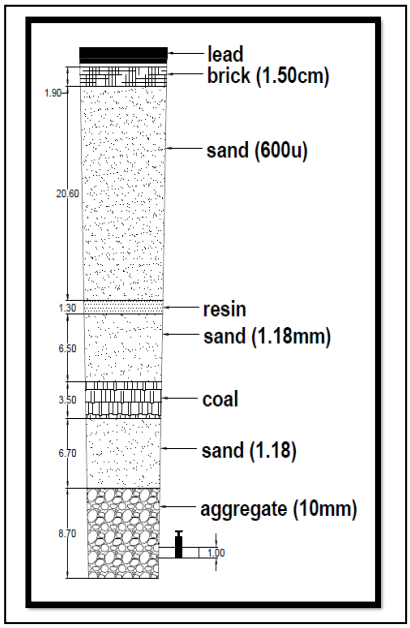

Fig. 1. *Greywater Filter Module*

B. *Labortry Analysis*

Physico-chemical analyses of the greywater collected were determined for the selected parameters:-

TABLE I. CHARACTERISTICS OF GREYWATER

Sr. No.	Characteristics of Grey Water (initial readings)	
	Parameters	***Inlet Readings Subhead***
1	Physical Observation	Turbid
2	Odour	Soapy
3	Turbidity (NTU)	204
4	PH-Value	8.90
5	Chlorides	160
6	Nitrates	20.11
7	Total Hardness	190
8	Alkalinity	50
9	Permanent Hardness	140
10	Iron	0.11
11	Fluoride	0.90
12	Total Dissolved Solids	470

TABLE II. CHARACTERISTICS OF SAMPLE GREYWATER

Sr. No.	Characteristics of Grey Water (Final readings)	
	Parameters	***Inlet Readings Subhead***
1	Physical Observation	Turbid
2	Odour	Soapy
3	Turbidity (NTU)	79.90
4	PH-Value	8.60
5	Chlorides	130
6	Nitrates	20.40
7	Total Hardness	110
8	Alkalinity	50
9	Permanent Hardness	60
10	Iron	0.160
11	Fluoride	0.85
12	Total Dissolved Solids	440

III. RESULT AND DISCUSSION

The results obtained from the physico-chemical characterization of greywater.

A. *Turbidity Test*

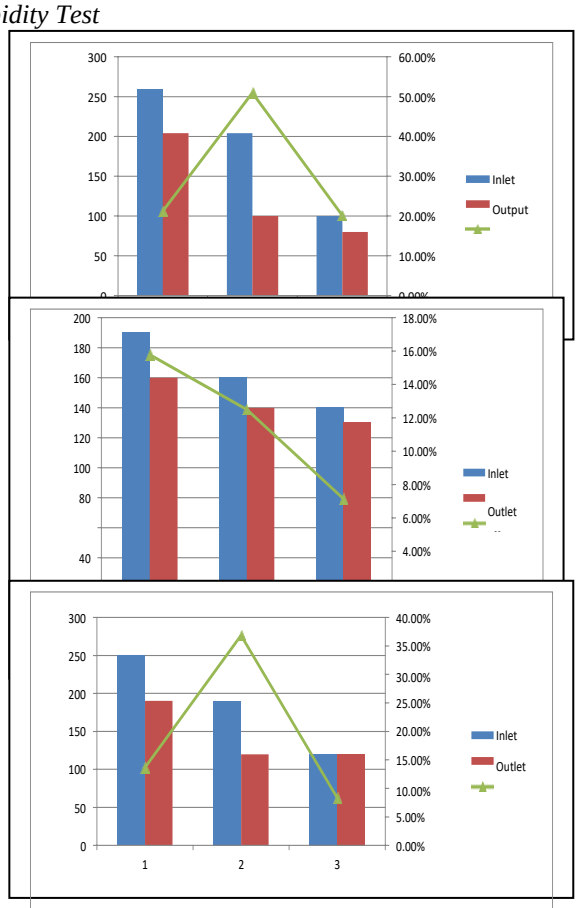

Fig. 4. *Total Hardness Graph*

The results obtained from the tests for various parameters, are within permissible limit suggested by the MPCB. Thus by reusing the wastewater upto 64% of potable water can be saved daily resulting in the reduction of requirement of fresh water along with the reduction in sewage generation, minimizing its impact on the environment

ACKNOWLEDGMENT

The authors would like to thanks the members of Batch-5 of Final Year Civil Engg. Mr. Varad A. Joshi, Mr. Shyam A. Shire, Mr. Vivek K. Ade for supporting this research.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 04, April-2020

REFERENCES

[1] Ayoup M. Ghrair (Dr.), "Greywater filtration systems ," Amman Clean Technology applications in Energy, water & environment workshop, 20-11-2011.

[2] Evan Wanjiru, Xiaohua Xia, "Sustainable energy-water management for residential houses with optimal integrated grey and rain water recycling", University of Pretoria 0002, South Africa, vol https://doi.org/10.1016/j.jclepro.2017.09.212

[3] Jose de Anda, Alberto Lopez-Lopez, Edgardo Villegas-Gracia & Karla Valdivia-Avina, "High-strength domestic wastewater treatment and resuse with onsite passive methods", Water 2018, 10, 99; doi:10.3390 / w10020099.

[4] Motoyuki Mizuochi, "Small-scale domestic wastwater treatment technology in japan, and the possibility of technological transfer", Asian Environment Research Group, NIES, Japan.

[5] Simon Fane, Chris Reardon & Geoff Milne, "Water wastewater reuse", Standards Australia. 2008. HB 326-2008: Urban greywater installation handbook for single housholds .

[6] B. F. Bakare; S. Mtsweni; S. Rathilal "Characteristics of greywater from different sources within households in a community in Durban, South Africa", Journal of Water Reuse and Desalination (2017) 7 (4): 520–528.

[7] Abu Ghunmi, L., Zeeman, G., van Lier, J. & Fayyad, M. □□□□ Quantitative and qualitative characteristics of grey water for reuse requirements and treatment alternatives: the case of Jordan. Water Sci. Technol. 58, 1385–1396.

[8] Antonopoulou, G., Kirkou, A. & Stasinakis, A. S. □□□□ Quantitative and qualitative greywater characterization in Greek households and investigation of their treatment using physicochemical methods. Sci. Total Environ. 454–455, 426–432

[9] APHA (American Public Health Association) □□□□ Standard Methods for the Examination of Water and Wastewater, 20th edn. American Water Works Association and Water Environmental Federation, Washington, DC

[10] Birks, R. & Hills, S. □□□□ Characterization of indicator organisms and pathogens in domestic greywater for recycling. Environ. Monit. Assess. 129, 61–69

[11] WHO Guidelines For The Safe Use of Wastewater, Excreta and Greywater, Volume 4, Excreta and Greywater use in Agriculture. Available from: http://www.who.int/ water_sanitation_health/publications/gsuweg4/en/ (accessed 24 October 2016)