

RECYCLING OF DOMESTIC GREYWATER AT HOUSEHOLD LEVEL¹V. V. Kokate, ²P. A. Hangargekar, ³D. C. PoulPG student S.T.B.C.E.Tuljapur (M.S) India¹, Associate Professor S.T.B.C.E.Tuljapur (M.S) India², Assistant Professor S.T.B.C.E.Tuljapur (M.S) India³
vivekkokate81@gmail.com¹, pahh@rediffmail.com², saidip.poul@gmail.com³**ABSTRACT**

India is facing water crisis and in next coming decade India's population will be suffering from severe water scarcity. To overcome this problem of water scarcity the alternative sources of water should be found out by recycling of domestic greywater. The use of greywater is becoming more common especially in areas where water scarcity problem. The use of greywater is therefore last option for the water conservation. Greywater use is important because it restricts fresh water demand and reduces stress on treatment system. Greywater content some minerals, organic, waste materials dissolved and suspended in it. It is possible to intercept this grey water at household level treat it so that it can be recycled for garden washing and flushing purposes. Greywater collected from a family home was analyzed for basic water quality parameters. The examined treatment system are intermittent sand filter. Produced effluent is expected to meet Indian standards set for reclaimed water reuse. The increase in water demand in recent years led to expansion of research and public policies on the reuse of water especially greywater. Thus we expect that future research on greywater reuse will take in developing countries that face water scarcity.

Keywords : *Greywater, reuse, household level treat.*

INTRODUCTION

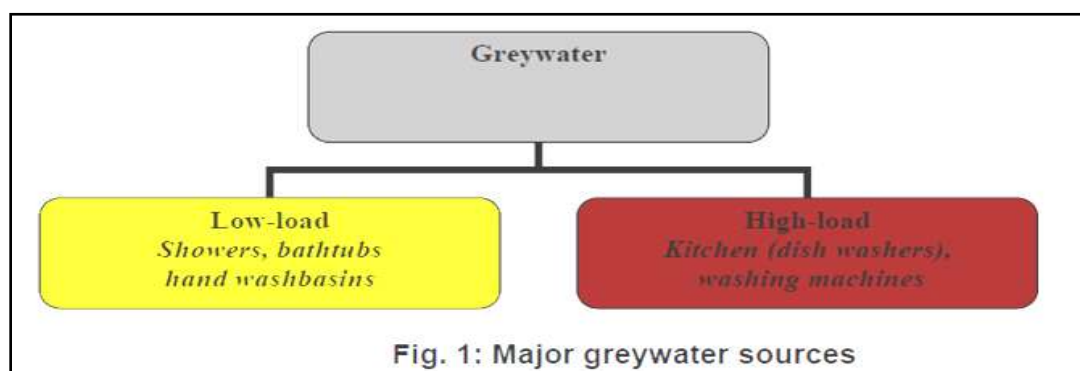
Greywater is all wastewater that is discharged from a house, excluding blackwater (toilet water). This includes water from showers, bathtubs, sinks, kitchen, dishwashers, laundry tubs, and washing machines (Figure 1). It commonly contains soap, shampoo, toothpaste, food scraps, cooking oils, detergents and hair. Greywater makes up the largest proportion of the total wastewater flow from households in terms of volume. Typically, 50-80% of the household wastewater is greywater. If a composting toilet is also used, then 100% of the household wastewater is greywater.

Not all greywater is equally "grey". Kitchen sink water laden with food solids and laundry water that has been used to wash diapers are more heavily contaminated than greywater from showers and bathroom sinks. Therefore, different greywater flows may require different treatment methods that would render the water suitable for reuse.

Greywater

High-load Kitchen (dish washers), washing machines

Low-load Showers, bathtubs hand washbasins



GREYWATER COMPOSITION AND CHARACTERISTICS

Water used in hand washing and bathing generates around 50-60% of total greywater and is considered to be the least contaminated type of greywater. Common chemical contaminants include soap, shampoo, hair dye, toothpaste and cleaning products. It also has some faecal contamination (and the associated bacteria and viruses) through body washing. Greywater from Cloth Washing Water used in cloth washing generates around 25-35% of total greywater. Wastewater from the cloth washing varies in quality from wash water to rinse water to second rinse water. Greywater generated due to cloth washing can have faecal contamination with the associated pathogens and parasites such as bacteria. Greywater from Kitchen Kitchen greywater contributes about 10% of the total greywater volume. It is contaminated with food particles, oils, fats and other wastes. It readily promotes and supports the growth of micro-organisms. Kitchen greywater also contains chemical pollutants such as detergents and cleaning agents which are alkaline in nature and contain various chemicals. Therefore kitchen wastewater may not be well suited for reuse in all types of greywater

| S.No. | Sources | % of Grey Water |
|-------|---------------------|-----------------|
| 01 | Bathing | 55 |
| 02 | Laundry | 20 |
| 03 | Washing of house | 10 |
| 04 | Washing of Utensils | 10 |
| 05 | Cooking | 5 |
| | Total = | 100 |

Table 01 : Greywater generated from domestic use

Domesic Waste water can be divided as-

A. Black Water Blackwater is water that has been mixed with waste from the toilet. Black water requires biological or chemical treatment and disinfection before re-use and after all these treatment there is no guarantee of safe reuse of water. It cannot treat completely and hence it is not safe and economical to reuse.

B. Grey Water Greywater is all water from sinks, shower, bath; laundry machine etc. water is all from domestic-basically anything but not toilet water. Water recycling of greywater uses various household system and methods and the water is used to flush toilets, irrigation cleaning and cloth washing. As pressures on freshwater resources grow around the world and as new sources of supply become increasingly scarce, expensive, or politically controversial, efforts are underway to identify new ways of meeting water needs. Of special note are efforts to reduce water demand by increasing the efficiency of water use and to expand the usefulness of alternative sources of water previously considered unusable. Among these potential new sources of supply is —greywater. Greywater, defined slightly differently in different parts of the world, generally refers

to the wastewater generated from household uses like bathing and washing clothes. This wastewater is distinguished from more heavily contaminated —black water from toilets. In many utility systems around the world, greywater is combined with black water in a single domestic waste water stream. Yet greywater can be of far higher quality than black water because of its low level of contamination and higher potential for reuse. When greywater is reused either onsite or nearby, it has the potential to reduce the demand for new water supply, reduce the energy and carbon footprint of water services, and meet a wide range of social and economic needs. In particular, the reuse of greywater can help reduce demand for more costly high-quality potable water.

Characteristics of Greywater –

| Parameters | Unit | Range |
|-------------------------|-------|----------|
| pH | - | 6.4-8.1 |
| Suspended solids | mg/l | 40-340 |
| Turbidity | NTU | 15-270 |
| BOD ₅ | mg/l | 45 |
| Nitrate | mg/l | 0.1-1.0 |
| Ammonia | mg/l | 1.0-26 |
| Total kjeldhal nitrogen | mg/l | 2-23 |
| Total phosphorus | mg/l | 0.1-0.8 |
| Sulphate | mg/l | 0.3-12.9 |
| Conductivity | mS/cm | 325-1140 |
| Hardness | mg/l | 15-50 |
| Sodium | mg/l | 60-250 |

Table 02 : Characteristics of Greywater

GREYWATER TREATMENT SCHEME

Primary treatment (Screening, Equalization tank)-Secondary treatment (Gravel filter, sand filter)
Secondary treatment-II. (Broken brick, Charcoal, Chlorination)- treated greywater

Fig.2 Treatment units.

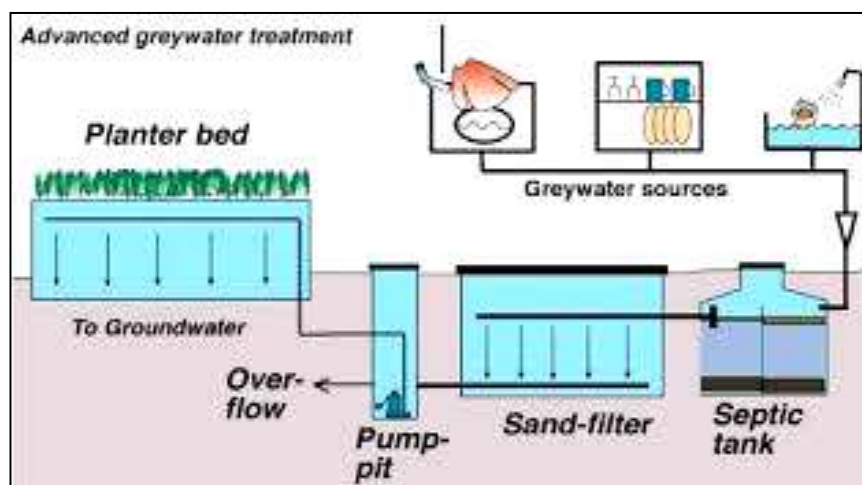


Table No. 03. Treatment units functions.

| Unit of treatment system | Removal |
|-----------------------------|---|
| Screen | Floating matter, suspended matter |
| Setting chamber | Odour, some of settleable solids |
| Equalization Tank (Holding) | Settleable solids |
| Horizontal Roughing Filter | Turbidity, suspended solids, some amount of BOD |
| Slow Sand Filter | Colour, bacteria, suspended solids and some amount of BOD |
| Disinfection | Bacteria, odour |

CONCLUSION

Since the intended use of water is for irrigation and toilet flushing the required treatment standards are therefore less stringent as compare to that for drinking purposes therefore the greywater is acceptable for reuse from the above study it can be concluded that greywater recycling can be viable option in the present situation of water scarcity.

Reuse, reduce and recycle serves dual purpose - it doesn't just make the waste reusable, but also helps to prevent water pollution and waterborne diseases which result in millions of death every year. Saving of liters of potable water per day if greywater is reuse.

It was suggested that grey water from kitchen sink and dish washer should not be reused as these can contain heavy loads of organic materials, fats and caustic additives in high concentrations that are not readily broken down by soil organism. Soaps and detergents are components in grey water which could adversely affect plants the most. Relating to these facts, we decided to test for its properties (physical, chemical and biological) and then purify it to meet up to the standards for its reuse.

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