RECYCLING AND REUSE OF GREY WATER

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***Abstract**: Greywater is the wastewater that is generated in houses and commercial buildings through the use of water for laundry, dishes and bathroom. This project's aim is to treat and reuse greywater for gardening, toilet flushing and street washing. The treatment system consists of natural process involving equalization cum sedimentation, filter bed consisting of sand, aggregates and marbles and collection tank. Physico-chemical parameters viz. turbidity, pH, total dissolved solids, hardness and alkalinity were analyzed. By this system results have shown that filtration increases DO concentration and other parameters decrease in greywater so as to make it usable. It is an effective method of treatment of greywater as compared to the conventional method so it can be implemented on small scale at houses, schools/colleges, commercial buildings, etc. Quantification of greywater generated from bathing, washing cloths and from basin was also done. Greywater reuse has the advantage that it is a possible technique where water consumption on daily basis can be reduced. Also to evaluate the awareness in people about greywater and health risk associated with it.*

***Keywords**: Filtration, Greywater, Reuse, Sources, Treatment.*

1.INTRODUCTION

1.1 Back Ground of Study

Waste water is generally made of black water and grey water. Grey water, also known as sullage, is non industrial wastewater generated from domestic processes such as washing dishes, laundry and bathing. Grey water 55% -75% of waste water .grey water is distinct from black water in the amount and composition of its chemical and biological contaminants.

Grey water gets its name from its cloudy appearance and from its status as being neither fresh nor heavily polluted.Due to scarcity of fresh water all over the world, balancing the supply and demand of fresh water has always been a great challenge. The recycle and reuse of waste water is considered as a strategy of water demand management (WDM) system. Many investigations have been conducted on domestic grey water quality analysis, treatment and reuse in the US, Japan and Australia. Grey water treatment system have been successfully implemented in the US, Japan and Australia to reclaim Grey water for non-potable uses. With the technological advancement and public acceptance, Grey water seems to be a potential source of water saving.

1.2 Benefits of Grey water Reuse

Water recycling and reuse has become an attractive option for conserving and extending available water supply in many countries because of their readily available water supplies. Recycled water has been widely used for non-potable reuse purposes such as agricultural and landscape irrigation, public parks irrigation, toilet flushing in the USA, EU, and Australia and some middle –east countries. Other non-potable urban uses of treated Grey water can be in fire suppression, air conditioning and soil compaction. High quality water does not required for such kind of non-potable uses. Recycle of Grey water will protect aquatic ecosystems by decreasing the diversions of freshwater, reducing the quantity of nutrients and other toxic contaminants entering waterways. it will reduce the need for water control structures .there are some other benefits of using Grey water . It reduces the total wastewater treatment cost as it lessens the organic and hydraulic loads of waste water treatment plant. Reclaiming nutrients in Grey water improves the soil quality. Grey water application in excess of plant needs is also a good way to recharge groundwater. Highly treated Grey water can be reused for aquifer recovery and storage.

1.3.Generation of Grey Water

Grey water comprises 50-80% of residential waste water (Amoah et al). Fig.1. Shows the various sources from which grey water is generated.

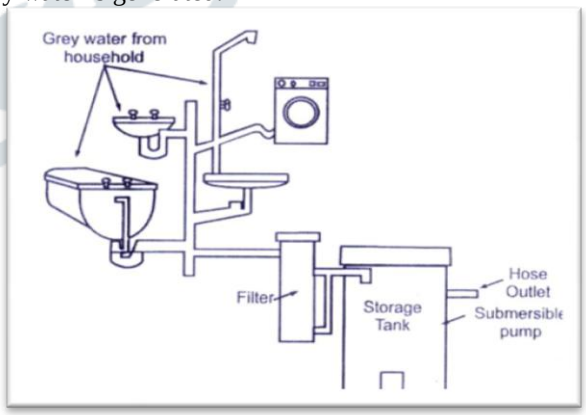

Fig. 1: Diagrammatic representation of household grey water generation

Table 1: Percentage of Grey Water Generated

Sr. No.	Sources	% Grey Water
01	Bathing	55
02	Laundry	20
03	Washing of house	10
04	Washing of Utensils	10
06	Cooking	5
Total		100

II. . EXPERIMENTAL MATERIALS AND METHODS

Laboratory scale integrated grey water system plant is designed for 10 lit/hr capacity restricted five components such as storage tank with 12 litres capacity, Filter-I (Gravel + Small Gravels) has 10litres Filter-II (Sand+Coconut shell coir + Charcoal),unit of 10 litres capacity.Dimensions and capacity of component of laboratory scale model are summarized in table 2.The sources of the grey water was collected from bathrooms and basins in residential rural area in a tank and sent to the primary storage unit. The components of integrated grey water system plant is as per fig. 1 contained the operation of sedimentation, filtration and disinfection tank. The gravitational force was used for the flow of water from one stage to another stage. The easily available and natural materials were used as filter beds in the filtration unit explained in table 2.The samples were collected from raw water for the analysis. These samples were analyzed by standard method for water and waste water analysis at environmental laboratory. The Parameters such as pH, total dissolved solids (TDS), Total suspended solids (TSS), turbidity, in Grey water were determined for each sample. Fig 2 shows integrated grey water treatment model. Fig.1 shows Diagrammatic representation of household grey water generation.

Table2:Dimensions And Capacity Of components Of Laboratory Model.

Sr.no	Component	Dimensions	Capacity
1	Storage Tank	Dia-20cm Height 22.5 cm	12 litre
2	Filter 1	Dia-20cm Height 22.5 cm	10 litre
3	Filter 2	Dia-20cm Height 22.5 cm	10 litre

Table 3 :Filter media in Filters

Sr.no	Component	Filter media	Layer Thickness
1	Filter-I (Large Gravel +Small Gravel)	L.Gravel(40mm)	8cm
		S.Gravel(20mm)	8cm
2	Filter-II (Sand+Coconut Coir +Charcoal)	Coir	4cm
		Sand (8mm)	8cm
		Charcoal	8cm

Fig2 :-Material Used

Fig 3 :- integrated grey water treatment plant

III. RESULT AND DISCUSSION

3.1 Performance of the integrated grey water treatment plant

The grey water was collected from the bathrooms, basins of the residential area.Total 02 samples of grey water were taken at first day and the performances of system were investigated for these 02 samples of grey water at steady state conditions and the average value data are summarized in Table 4.

Table 4:- chemical analysis of grey water

Sr.no	Parameter	Units	Before Treatment	After Treatment
1	Colour	--	Dark Grey	Light Grey
2	Odour	--	No smell	No smell
3	Hardness	mg/lit	708	588
4	Alkalinity	mg/lit	40	20
5	PH	--	8	7.3
6	Turbidity	NTU	288	90
7	Chlorides	mg/lit	86.8	121.8
8	TSS	mg/lit	320	120
9	TDS	mg/lit	405	240

VI.CONCLUSION AND RECOMMENDATIONS

Water shortage in India will be a key issue for its sustainable development in the future. India is facing a water crisis and by 2025 it is estimated that India's population will be suffering from severe water scarcity. International Water Management Institute (IWMI) predicts that by 2025, one in three Indians will live in conditions of absolute water scarcity. Conventional groundwater and surface water sources are becoming increasingly vulnerable to industrial and natural pollution. The best alternative and cost effective process in rural areas is the reuse of grey water. The potential of potable water savings can be substantial by using these proposed greywater treatment systems.The present study demonstrate the reuse and treatment of residential bathrooms, basins waste water called as grey water for the purpose of landscaping, gardening, irrigations, plant growths and toilet flushing. Based on finding of this study, this treatment technology can be considered as a viable alternative to conventional treatment plants in rural region since they are characterized by high potential for BOD, TDS, TSS, total hardness, oil and grease, anions and cations removal. The benefits found are low energy demand, Less operating and maintenance cost, lower load on fresh water, less strain on septic tank, highly effective purification, and ground water recharge. Hence, this is an environmental friendly, without chemical operation, cost effective and resourceful plant forrural development.

REFERENCE

[1] Agunwamba J.C. grey water reuse for irrigation,international journal of applied science and technologyvol 2 no.8 October 2015.

[2] Anwar, Effect of laundry Greywater irrigation on soilproperties , journal of environmental research anddevelopment , 2011,5(4) 863-870.

[3] Misra,R.K.and sivongxay,a reuse of laundry Greywater asaffected by its interaction with saturated soil , journal ofhydrology,2009,366(1-4):55-61.

[4] A H M Faisal Anwar (2012), " Reuse of laundry greywater in irrigation and its effect on soil hydrologic parameters", International conference on future environment and energy, IPCBEE vol 28 , IACSIT Press,Singapore.

[5] Saroj B. Parjane Performance of grey water treatment plant by economical way for Indian rural development International Journal of Chem. Tech Research CODEN (USA): IJCRGG ISSN: 0974-4290 Vol.3, No.4, pp 1808-1815, Oct-Dec 2011.