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TREATMENT AND DISINFECTION OF GREYWATER FOR REUSE

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Abstract:-This paper is related to the reuse of greywater as water is rare source in future. Greywater is the type of wastewater which is generated from domestic purposes. Kitchen wastes are also considered as sewage water because it contain high organic loading. Now a day's reuse of greywater is very much popular. People were aware of using greywater for reuse. Grey water also contains pathogens and there is potential for spreading illness. In Madhya Pradesh and in several other states, groundwater is a major source and temporarily supplemented by surface or rainwater during monsoon. Besides other needs, the demand for water has increased enormously with agricultural, industrial and domestic sectors consuming 70, 22 and 8% of available fresh water and this has resulted in the generation of large amount of wastewater containing a number of pollutants. Various treatment technologies have been employed to store greywater for irrigation purposes. Greywater treatment system can play a very important role in future water management and prospective sustainable living.

This paper is focuses on the analysis of removal of color, odor and pathogenic bacteria from greywater by using activated charcoal which is easily available on the market. It is also focuses on the recycle of greywater and disinfection of treated greywater that is mainly generated from domestic activities such as laundry and bathing excluding kitchen wastewater which can be recycled on laboratory scale for uses such as street washing gardening and toilet flushing by using various parameters i.e., pH, COD, BOD, DO, total solids, suspended solids, dissolved solids, conductivity, hardness and alkalinity.

Keywords:-Greywater, Reuse, Removal, colour, odor, pathogenic bacteria.

I. INTRODUCTION

Water is becoming a rare source in the world. It is essential to reduce surface and ground water use in all sector of consumption, to substitute fresh water with alternative water resource to optimize water use efficiency through reuse option. These alternatively resources include rainwater and greywater. Greywater is commonly defined as wastewater generated from bathroom, laundry and kitchen. Greywater means untreated wastewater that has not been contaminated by any toilet discharge, also not affected by infectious, contaminated or unhealthy bodily waste, and does not present a threat from contaminated by unhealthful processing, manufacturing or operating waste. Greywater includes wastewater from bathtubs, shower and bathrooms washbasins, clothe washing machines and laundry tubs, but does not include wastewater from kitchen sinks and dishwashers. Greywater originating from all household water generating appliances except for toilets, comprising 60-70% of the in house water demand. Due to rapid industrialization and development, there is an increased opportunity for greywater reuse in developing countries such as India. The use of agriculture irrigation purposes is occurring more frequently because of water scarcity and population growth. The treated water can be supplied for irrigation of indoor plants as the greywater is most suitable for this purpose. [1, 2, 3]

1.1 Composition of Greywater

1.1.1Greywater from Bathroom

Water used in hand washing and bathing generated 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 has also some faecal contamination through body washing. [4,5]

1.1.2 Greywater from Cloth washing

Greywater from 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.[4,5]

1.1.3 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 system. [4, 5]

II. METHODOLOGY FOR TREATMENT OF GREYWATER

Usually water treatment plants follow a conventional process of three steps- primary treatment, secondary or Bio treatment and tertiary treatment. First, different parameters of the greywater collected were tested. They are as follows:-

Parameter	Value
pH	9.8
TDS	23.2gm/l
TSS	3.52gm/l
BOD_5	130mg/l
Alkalinity	1225mg/l
Turbidity	12NTU

The experiment was set-up in environmental laboratory. The greywater treated in this experiment was conducted from residential apartments, the apartment has an average of eight flats, the sanitary installation comprises a bathroom in each flats. The greywater is collected from the outlet of the building with the help of bucket and pipes. In each day 60 liters of greywater is collected for treatment. The treatment unit consists of sedimentation cum coagulation tank, filtration tank and the collection tank. The sedimentation cum coagulation tank equalizes the quality and temperature of raw greywater and particles are also allowed to settle under gravity. This unit has a volume of 60ltrs. The filtration unit is a 20 ltr bucket filled with layer of marbels acting as drain with size range of 5mm-15mm to a height of 10cm from the bottom of the unit. Gravels with three different sizes of layer of about 15mm, 10mm and 5mm on the top of the marbels to a height of 15cm. A sand filter media with 0.6mm to height of 15cm on the top of gravel and activated charcoal to height of 10cm on the top of sand. The adsorption layer contains activated charcoal for the removal of chemical and organic impurities from the greywater. The sand screens off particles larger than its pores size while the gravel and marbel acts as a drainage system to let off filtered water.

After treatment of the raw greywater sample. The initial parameters of the water were tested. And following results was obtained:-

Parameter	Value
pH	7.2
TDS	3.2gm/l
TSS	0.03gm/l
BOD_5	4mg/l
Alkalinity	0.21mg/l
Turbidity	3NTU

III. DISINFECTION

Disinfection is the process of eliminating pathogenic organism in water. Disinfection technologies can be broadly categorized as chemical and physical based system. Physical disinfection technologies include ultraviolet light and ultrasound energy, which separate microorganism from the water, by filtration through media or a membrane. Chemical disinfection technologies include plant essential oils. Microorganism inactivation by disinfection processes are influenced by the characteristics of the water to which the disinfection is applied. These characteristics include: the specific microorganism present, temperature, pH, chemical constituents and physical constituents. Chemical disinfection involves the addition of a compound to water that is toxic to microorganisms, causing their inactivation. The most common chemical disinfectants are chlorine and ozone, which are highly oxidizing chemicals. Physical disinfection processes involve either the addition of energy to water to bring a out microbial inactivation as in the case of ultraviolet lights and ultrasound or the mechanical separation of microorganism from the water by filtration through media or a membrane. [14, 17]

IV. OBJECTIVE

1. To find an economical way to treat water.
2. To design a filtration-adsorption system for the treatment of greywater.
3. To evaluate physic-chemical treatment process of the raw greywater and treated greywater.
4. Recycle and reuse of greywater for economic profit.
5. To investigate and evaluate the health risk due to the reuse if any.
6. To assess acceptability and awareness of greywater reuse.

V. RESULTS AND DISCUSSION

From all the paper the result was found that storage of treated greywater is not possible more than 24 hrs. If it is stored for more than 24 hrs then harmful bacteria will be growing and it can cause diseases like lung infections, ingestion, gastroenteritis, eye and skin infection, pneumonia, pulmonary diseases and toxic shock syndrome. The treated greywater is directly releases into the irrigation field, but before releases it can be mixed with coagulant aids like alum, bleaching powder etc. for the removal of harmful pathogenic bacteria. In all the experiments peoples were used to remove physic-chemical and biological parameters from the greywater, but fail to remove color and odor.

VI. CONCLUSION

The study concluded that the cost of the system is economical. The system provide benefit such as improved education, clean environment and time available for other activities. In this paper an attempt has been made to develop water regeneration cycle which can reduces the use of potable water. Various qualitative and quantitative parameters for both raw water and treated water have been compared. The results for treated water are good enough to be directly pumped to the overhead tank for supply to be used. Thus greywater treatment system can play a very important role in future water management and prospective sustainable living.

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