

## SUSTAINABLE GREYWATER TREATMENT SYSTEM : A REVIEW

Debashree Majumder

Assistant Professor, Department of Civil Engineering  
Dr.D.Y.Patil College of Engineering & Innovation, Varale, Pune  
smajumder1956@gmail.com

Aniket Patil

BE, Department of Civil Engineering  
Dr.D.Y.Patil College of Engineering & Innovation, Varale, Pune

Ravi Waghela

BE, Department of Civil Engineering  
Dr.D.Y.Patil College of Engineering & Innovation, Varale, Pune

Nikhil More

BE, Department of Civil Engineering  
Dr.D.Y.Patil College of Engineering & Innovation, Varale, Pune

Akshay Mohape

BE, Department of Civil Engineering  
Dr.D.Y.Patil College of Engineering & Innovation, Varale, Pune

**ABSTRACT—** Water is important natural resources. Nowadays the world is facing water scarcity issue as the water resources are depleting day by day. The water reserves which are there are also getting polluted due various wastes. As a result of this there is a need to recycle and reuse the domestic wastewater so that water could be made available in water deprived areas. Domestic wastewater contains various impurities, bacteria, BOD, COD and various other minerals which are to be removed in order to reuse this water for other purposes. Various methods have been implemented to treat the water to make it safe for other purposes. One of such method is use of reed beds to treat wastewater. The following study concentrates on the use of reed beds to treat the greywater and to make it fit for irrigation purpose, flushing purpose, etc.

**Keywords -** Greywater, Reed bed

### I. INTRODUCTION

Water is a very important natural resource which is very important for our day to day life. As we all know water scarcity is an ongoing issue in the world due to increasing population. More than 70% of our fresh water bodies are polluted today. Ground water table is depleting rapidly and the country is facing the major problem of ground water contamination affecting as many as 19 states [3]. Recycling and reusing the domestic wastewater in the water deprived areas could be of great use. Greywater contains huge amount of toxic pollutants, oil & grease, phosphorous, nitrates, Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Total suspended solids (TSS), Total solids (TS). These pollutants are to be removed in order to reuse it for further purposes. This treated greywater can be used for agricultural purposes, gardening, flushing systems etc. Reed beds are natural aquatic plants found in nature. These aquatic plants are available in marshy, floodplain areas. Such plants are capable of treating the wastewater by creating an appropriate atmosphere for the

various micro-organisms, pathogens, algae, etc. to grow on a large scale and to clean the wastewater by utilizing the waste into the wastewater. The effluent obtained from this reed bed is of good quality which could be used for various other purposes. As a result of this various small scale reed bed plants have been set up in order to treat and reuse the wastewater. Following are some of the types of aquatic plants i.e. Phragmites australis, Sweet grass (Glyceria maxima), Canary reed grass (Phalaris arundinacea), yellow flag iris (Iris pseudacorus), reed-mace and brooklime (Veronica beccabunga).

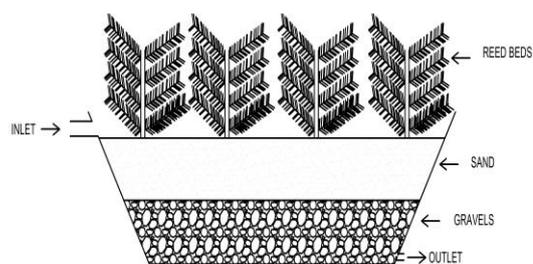


Fig 1 - Reed Bed

### II. LITERATURE REVIEW

In this review they have done a project on sand filtration in order to treat the domestic wastewater. In this method they explained the construction and operation of sand filter method for wastewater treatment. Sand filtration method treats the wastewater in three different ways i.e. Filtration, Chemical sorption, Assimilation. The results obtained were good enough so that the water treated could be used for agricultural and various purposes [1].

In this review they have written a journal on domestic wastewater treatment using bio-filtration. Bio-filtration is filtration technique in which worms are used for filtration of wastewater. In this method a bio-filter plant was built to treat the wastewater in the campus of Gharda Institute of Technology. This bio-filter media consisted of pure soil, wooden chips and it also has cow dung in which earth

worms are released. The result so obtained concluded that vermifilter is an efficient technique for removal of BOD, COD, odour and solids [2].

In this review they have studied on the various physico-chemical characteristics of domestic wastewater in Nanded city in this paper. They collected the sample of domestic wastewater from the drainage whereas the samples were collected in the month of April to June. The samples were collected from below the surface in order to avoid the impurities present on the surface of water. The water collected were analyzed to determine the characteristics such as pH, Biochemical oxygen demand(BOD), Chemical oxygen demand(COD), Nitrogen, Nitrate, Phosphate, Total dissolved solid(TDS), Total suspended solid(TSS)[3].

In the following article they have developed a filtration unit in order to treat the wastewater coming from the kitchen. The kitchen wastewater contains fat, oil and grease in large amount which are to be removed in order to reuse the water. In this the filtered the water by three different media which were placed in proper arrangements. The results so obtained were within the permissible limit so that treated water can be supplied for agricultural purposes [4].

They have designed a fly ash filter media in order to treat the waste water. In this method the fly ash was sieved through 90 $\mu$ m and the retained fly ash was washed with distilled water and dried at room temperature for 24hrs. The dried fly ash was filled in a container 10cm thick and the waste water sample of 1000ml was filled in a container. The sample percolated in the filter bed, the retention time was about 1.30hrs. The effluent was analyzed for various parameters. The result concluded that fly ash can be efficiently used for the treatment of domestic waste water as the values of parameters were reduced by more than 60% [5].

He has done his study on use of Hybrid Upflow Anaerobic Sludge Blanket reactor (HUASB) in this paper. The water sample was collected from sewage treatment plant in Maharashtra. The water was treated using HUASB reactor whose working volume was about 5.9L. The effluent so obtained was free from both COD & BOD in a very short period of time [6].

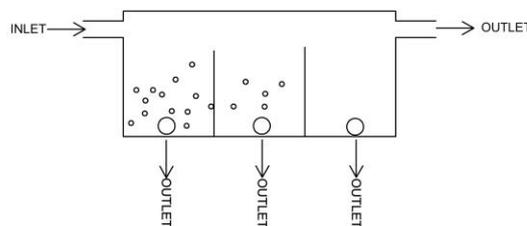
They have suggested in his studies that treating the greywater could be a very good solution for conserving the wastewater. In this paper he has tried to treat the greywater coming out of college canteen and the girl's hostel. He used physical, chemical and biological processes to treat the water. The results were as he expected as the water treated was good enough to reuse for other purposes [9].

They have study on treating the waste water using activated charcoal. They designed a filter which was made from coarse aggregate, fine aggregate and activated charcoal. The effluent obtained was very pure as it was free from all the impurities, odor, taste, solids, etc. [10].

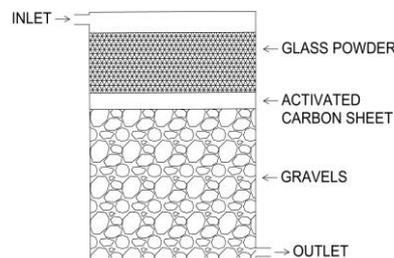
### III. METHODS AND MATERIALS

In this paper we are going to use reed bed in order to treat domestic waste water in t. The reed bed is to be kept in a water tight membrane in order to avoid leakage. The

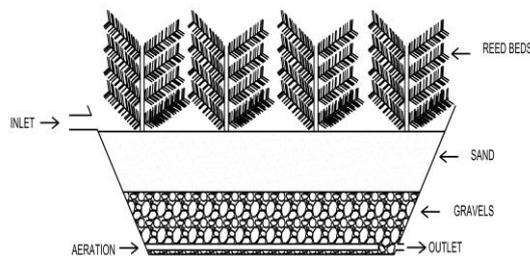
influent at first is allowed to flow in a settling tank which is divided in three compartments in order to achieve maximum efficiency and to remove maximum solids present the water. The water coming out of this settling tank is then allowed to flow through a filter which consists of three layers. The three layers are gravel, activated charcoal sheet and glass powder. The use of glass powder is that they are negatively charged particle as a result of which they attract the heavy metals present in water whereas activated charcoal sheet is used to adsorb the natural organic compounds, changes the odor and taste of the wastewater. After this the wastewater flows through the reed bed. This filter comprises of two layers, the bottom most layer is of course aggregates, and the above layer comprises of soil. An aeration system is provided at the bottom of the filter in order to carry out the biological process. The effluent so obtained is of such a quality that it could be used for agricultural purpose, etc.



**Fig 2 – Settling tank**



**Fig 3 – Filtration unit**



**Fig 4 – Horizontal flow reed bed**

### IV. CONCLUSION

From literature study it's observed that domestic waste water which is used for the treatment should get treated as per the requirements. The water should be free from all the soluble and insoluble particles, micro-organisms, odor, chemicals etc. It should not have any harmful effect to the environment.

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