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Treatment of Greywater by Using Natural Media

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ABSTRACT

The study is an attempt to evaluate the performance of multimedia filter technology an alternative method for treating greywater. Treated water use for firefighting, Irrigation, toilet flushing, gardening, car washing, etc. This technology is environment friendly and cost effective. Multimedia Filters represent a significant improvement over single media filter. A multimedia filter model was developed by G.I. sheet for treatment of domestic greywater. Different packing media are used such as seashells, sugarcane bagasse and banana fiber. The Multimedia Filter process had given an excellent result and significantly assist in the removal of pH, TDS, BOD, COD, hardness and will improve the physio-chemical quality of the effluent.

Keyword: -Sugarcane bagasse,Seashells, Banana Fiber, Domestic greywater, Natural Media, Multimedia Filter.

1. INTRODUCTION

There are two problems that the world is facing on a large scale right now they are waste water pollution and drought.Wastewater that were discharge to the environment; it's become one of the contributing factors to water pollution in developing countries.Because of the scarcity of clean water, treated greywater potentially provides an alternative source for irrigation, flushing, gardening. The domestic greywater is characterized in terms of its physical, chemical and biological composition and this composition of greywater changes depending on the location of the source, seasonal variation, climate, time of day, water consumption and population. For removing organic pollutants from water, different low-cost materials are used as adsorbents.In this study, Sugarcane bagasse, Banana fiber, seashells are used to treat greywater which are good at filtration and are easily bio-degradable.

The main advantage of filtration process is that they maintain high concentration of microorganism resulting in high removal rate. Filtration technology is a low-cost treatment technology based on physical process to treat greywater contaminants like colour, odour, pH, hardness, BOD, COD and Total solid etc. for a wide range of application in domestic for improving excellent quality of the greywater.Knowing the increased demand for groundwater in urban areas and cities, the water should be recycled or treated before releasing to natural water sources such as rivers or lakes or in open land as groundwater recharge. Considering this the domestic greywater has been treated in small scale which is more or less effective and can be re-used for various purposes such as lawn irrigation, flushing of toilets etc., The low-cost filter is a household point-of-use water treatment system, and has been identified as a sustainable and suitable water treatment technology in rural remote areas in developing countries. This paper intends to provide an overall vision of multimedia filter technology an alternative method for treating greywater.

2.LITERATURE SURVEY

We will discuss the literature related use of Natural filter media for treatment of grey water. In the project it has been achieved to review the literature available in the field of wastewater treatment by using natural filter technology. Some of important literatures connected with topic are furnished below:

This paper intense to provide an overall vision of multimedia filter technology an alternative method for treating waste water. Treated water use for Irrigation, toilet flushing, car washing, gardening, firefighting, etc. Filtration technology is the simplest and low-cost treatment technology based on the principle of attached growth process. Multimedia Filters represent a significant improvement over single media filters. A multimedia filter model was developed by G.I. sheet for treatment of domestic wastewater. Different packing media are used such as Activated carbon, sugarcane bagasse, sand and grass mulch.[1]

The natural fibrous materials which are effective in purification purpose has been identified and used for domestic purification. The materials used as a filter bed in this study are Sisal fiber, Areca husk fiber activated carbon and river sand. The removal efficiency of these materials has been studied by setting the filter bed for different contact period. Influent greywater sample (raw water) and effluent greywater smaple (treated water) collected and analyzed for pH, TDS, TSS, TH, BOD, COD, oil and grease, chloride and sulphate in the laboratory and compared with THPCB and WHO standards. The removal efficiency of this parameter is between 0 to 25 are 12.5% (TDS), between 30 to 40 are 50% (TH, BOD, COD, sulphate) and 40 to 50 are 25% (TSS, oil and grease) and above 50 are 12.5% (Chloride).[2]

In recent years, the natural fibres have attracted substantial importance as potential structural material. Natural fibres are very fast replacing the traditional manmade fibres as reinforcements they have several advantages over manmade fibres. The abundant availability of natural fibre in India such as Jute, Coir, Sisal, Pineapple, Ramie, Bamboo, Banana, Bagasse etc. gives attention on the development of natural fibre composites primarily to explore value-added application avenues. Thousands of tons different crops are produced but most of their wastes do not have useful utilization. These different crops waste can be used with polymer to form natural fiber polymer composites for many applications. The wastage is used to prepare fiber reinforced polymer composites for commercial use. Natural fiber is used as an alternative resource to synthetic fibres as well as reinforcement for polymer composite materials and the manufacturing is inexpensive, renewable and environment friendly. Natural fibers have low cost, low density and low durability as compare to synthetic fibers but with the help of fiber treatments, mechanical properties of natural fibres are improved. This review discusses about the use of bagasse fibre and its current status of research. Bagasse fiber is a residue of a sugarcane milling process. The present use of bagasse is mainly as a fuel in the sugar cane mill furnaces.[3]

3. MATERIALS AND METHODOLOGY

3.1 Materials

- Greywater:

Greywater is defined as wastewater that includes water from baths, showers, hand basins, washing machines, dishwashers, and kitchen sinks, but excludes streams from toilets. Some authors exclude kitchen wastewater from the other greywater streams. Wastewater from the bathroom, including showers and tubs, is termed light greywater. Greywater that includes more contaminated waste and from laundry facilities, dishwashers and, in some instances, kitchen sinks is called dark greywater.

- Sugarcane Bagasse:

Sugarcane bagasse is major by-product of the sugarcane industry. Sugarcane produces mainly two types of biomass, sugarcane trash and bagasse. Sugarcane trash is the field residue remaining after harvesting the sugarcane stalk while bagasse is the fibrous residue left over after milling of the sugarcane. Bagasse contains mainly cellulose, hemi cellulose, pentosans, lignin, sugars, wax, and minerals.For every 100 tons of Sugarcane crushed, a Sugar factory produces nearly 30 tons of wet Bagasse. Sugarcane Bagasse is as shown in Fig-1.

Preparation of sugarcane bagasse: The collected sugar cane bagasse was washed thoroughly with water to remove the colour and dried in sunlight. The dried bagasse was grind and sieved to the desired particle size and used for adsorption studies.

Fig -1: Sugarcane Bagasse

The chemical composition of sugarcane bagasse is given in Table 1.

Table 1: Chemical composition of sugarcane bagasse

Cellulose (%)	45-55
Hemi cellulose (%)	20-25
Lignin (%)	18-24
Pectin (%)	0.6-0.8
Ash (%)	1-4
Extractives (%)	1.5-9

- Seashells:

Seashells which are a renewable resource and abundantly present, are mostly considered as a waste material. From the recycling viewpoint, seashells can be used as a raw material in many applications. Seashell is a natural calcareous material that can be used as a filter media in household greywater treatment system . The sheshells which were used is as shown in fig-2. Seashells are mainly comprised of calcium carbonate. Seashell media technology can be considered as a group of biofilter and to control pH in conventional filters, seashells can play a vital role.

Fig – 2: Seashells

Preparation of seashells: Collect the seashells from water resources such as river, sea, etc. After collecting, wash them thoroughly with water to remove the unwanted materials like soil, sand & mud and dried in sunlight. Select the seashells with size of range 150-250 mm. These selected seashells are used in the filtration unit.

- Banana fiber:

The banana fiber is used as natural adsorbent. Adsorption of pollutants by banana fiber is one of the emerging methods of biological treatments. Therefore, this become environmental friendly for the removal and recovery of pollutants.This study has focused on the effectiveness of the kitchen wastewater treatment using low-cost natural fiber from banana trunk. Banana fibres are shown in Fig-3.

Fig – 3: Banana Fiber

Preparation of banana fiber:Initially the banana plant sections were cut from the main stem of the plant and then rolled lightly to remove the excess moisture. Impurities in the rolled fibers such as pigments, broken fibers, coating of cellulose etc. were removed manually by means of comb, and then the fibers were cleaned and dried.

3.2 Methodology

The filtration tank was constructed from metal plate and the rectangular filtration tank is 0.75 m high, 0.15 m long and 0.15 m wide. The tank has a compartment of the filter medium where various filtering materials were placed.The domestic greywater was collected from local drainage system. The wastewater from inlet tank enters the inlet chamber and flows in down flow regime sequence. The compartments were packed with seashells, Sugarcane Bagasse and banana fibers in down flow regime respectively. The wastewater was collected in the collecting chamber and after reaching the outlet level the treated effluent was collected in the outlet tank.

4. RESULTS AND DISCUSSION

It was observed that that adsorbent materials such as Sugarcane Bagasse, Banana fibre and seashells media may prove to be more efficient in improving the effluent quality in terms of its physiochemical content. It was also observed that the experimental filter model will significantly assist in the removal of BOD, COD, TDS, hardness and will also improve the pH quality of the effluent

Comparison of parameters Before & After Filtration is given below in Table 2:

Table 2: Comparison of parameters Before & After Filtration

Sr.No.	Parameters	Units	Before filtration	After filtration
1	Colour	Hazen	Grey	Light Grey
2	Odour	-	Non offensive	Non offensive
3	pH	-	8.4	7.9
4	Hardness	mg/l	294	121.7
5	BOD	mg/l	118.3	42.6
6	COD	mg/l	226	89.8
7	TDS	mg/l	641	574

5. CONCLUSIONS

The Multimedia Filter process had given an excellent result and significantly assist in the removal of pH, TDS, BOD, COD, hardness and will improve the physio-chemical quality of the effluent. Based on the results of this study, it can be concluded that sugarcane bagasse have good performance to adsorb of oil byproduct from polluted water especially for high concentration of pollutant.It was observed that seashells media has the ability to trap large size particles and so it is also responsible for clogging of filter.It was also observed that the sugarcane bagasse deteriorates faster than banana fiber and seashells, hence it requires more maintenance than others.The media used in this study such as sugarcane bagasse and banana fiber are bio- degradable and has no negative effect on environment.It can also be concluded from the study that the Multi-Media filter may be considered as efficient pre-treatment process for wastewater treatment. Hence, this technology is environment friendly and cost effective.

6. REFERENCES

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