

Experimental Investigation on Treatment of Grey Water Using Multimedia Filtration

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ABSTRACT: The most significant element involved in growth and evolution of life has become a scarce essential commodity and should be used conservatively. As demand for water has increased in TAMIL NADU it is facing a severe drought and the whole country is having problems in meeting the demands of clean accessible water as the water resources are limited. Therefore, the only pragmatic approach to combat this situation of drought is water treatment. Wastewater treatment involves the reuse of waste water from factories, households and waters from polluted rivers or lakes. Filtration is one important method which is a process for separating the contaminants from wastewater by passing through a porous media Multimedia Filter. Also, they are a significant improvement over single media filters. Three filters were developed using different media such as plastic scrubbers, Citrus X sinensis (orange) skin, chrysopogon zizanioides (vettiver) and aerocon stones of varying sizes. The filters were placed in series. The laboratory scale multimedia filter model was operated for different detention time. The results evidenced from this experimental study showed effective reduction of BOD as 70%, COD as 60 % and TS as 80% for a detention time of 24hrs. The waste water samples were physiochemically characterized before and after treatment according to standard procedure using these adsorbents. The results obtained from the various pollution indicators show an appreciable improvement on the quality of the water. Therefore, this paper intends to provide an overall vision of multimedia filter technology as an alternative and conventional method for treating waste water. Treated water can be used for agricultural purposes, flushing toilets, washing vehicles, gardening, firefighting and many other areas.

KEYWORDS: *Vettiver, Domestic wastewater, Filtration, orange skin, Multimedia filter.*

I. INTRODUCTION

There are two problems that the world is facing on a large scale right now they are water/waste water pollution and drought. Both of these problems are interconnected and are they are the solution to each other. Wastewater also known as sewage is any water that has been affected by anthropogenic influence. It basically comprises of liquid waste discharged by domestic, industrial, commercial or agricultural activities and can encompass a wide range of organic substances, pathogenic organisms, heavy metallic materials, nutrients which can stimulate the growth of aquatic plants and severe toxic compounds that can be mutagenic or carcinogenic. In India, the major problem leading to waste water pollution is due to the increasing population, industrialization and urbanization. Collection, treatment and disposal of domestic and industrial Waste water are the serious issues to be handled for preventing damage to the environment. If waste water is left untreated or if it were discharged into a water body it could cause serious problems to all forms of life and cause nuisance conditions including the production of malodorous gases. Wastewater generated in these areas are normally treated by traditional waste water treatment plant processes like primary sedimentation, aeration, secondary treatment and chlorination. This form of treatment plants requires high initial investment. Therefore, there is a need for cost-effective and environmentally acceptable technologies for treatment of wastewater.

Filtration is one of the oldest and simplest and low-cost treatment methods of attached growth process for removal of contaminants such as COD, BOD and SUSPENDED SOLIDS for a wide range of domestic and industrial utilization. The Multimedia filter shows a notable improvement over single media filters. These filters are filled with a variety of packing media of different sizes. They basically work on the principle of attached growth process where the microorganisms are responsible for removing, metallic substances organic materials and unwanted nutrients. In this

experiment materials such as plastic scrubbers, orange skin, porous aerocon media are proven to be more efficient in improving the effluent quality in terms of its BOD and suspended solid content. The present research mainly aims to develop a promising and cost-effective technique for domestic wastewater treatment. The conventional treatment process was upgraded and, a laboratory scale model of the multimedia filter was developed.

II. MATERIALS USED

The materials used in this experiment are easily available and can be used extensively even on large scale filters. The types of media, sizes, surface porosity and roughness of filter media directly impact the efficiency of the multi media. Therefore, in order to obtain the higher removal efficiency a suitable filter media should be selected and designed. A filter media is one of the chief components in the multimedia filter system due to its large surface area that will enhance the microbial growth. Three media of varying sizes such as plastic scrubbers, Citrus X sinensis (orange) skin, chrysopogon zizanioides (vettiver) and aerocon stones of varying sizes were used in the present study.



Figure 1. Plastic scrubbers



Figure 2. Aerocon stones



Figure 3. Chrysopogon zizanioides (vettiver)



Figure 4. Citrus X sinensis (orange) skin

III. EXPERIMENTAL SET UP

The aim of the study is towards designing Low-cost filter model and treatment of domestic waste water by filtration process using low-cost natural adsorbents and study the performance of multimedia filter with different packing media. It is based upon the concept of attached growth process. The laboratory scale model was fabricated with PET Bottles and consists of three reactors placed in series with the total reactor volume of 3 liters with upflow and down flow regime. Three reactors were packed with different packing media of different sizes. The domestic wastewater was fed into the first reactor, after partial treatment it enters the second reactor and then to the

third. The wastewater which was partially treated in the first reactor moves to the second reactor which is the up-flow regime. The wastewater thus rises evenly at the same time it gets treated. The wastewater from the second reactor enters the third reactor in a uniform manner. The wastewater thus passes uniformly through the third reactor and gets treated and enters the collecting chamber by the up-flow movement. The waste water was collected in the collecting chamber and once reaching the out level the treated effluent was also collected in the outlet tank. The model was packed with plastic scrubbers, Citrus X sinensis (orange)skin, chrysopogon zizanioides (vettiver) and aerocon stones of varying sizes as packing media in layered configuration.

IV. RESULTS

During the study, the effluent was collected and was analysed for various parameters such as pH, BOD, COD and TS. Throughout the study the multimedia filter was operated for varying detention time of 18hrs, 21hrs and 24hrs. It was observed that removal efficiency for BOD was 70%, COD was 60% and TS was 80% for 24 hours of detention time and listed out in tables below. The multimedia filter process gave best results for TS removal.

Sl.no	RAW SEWAGE				TREATED SEWAGE				PERCENT INCREASE / REMOVAL			
	pH	BOD	COD	TS	pH	BOD	COD	TS	pH	BOD	COD	TS
1	7.25	193	342	352	8.3	85	164	47	14.48	55.95	52.04	86.64
2	7.30	215	412	402	8.13	79	205	67	11.36	63.55	50.36	83.33
3	7.39	263	332	401	8.25	105	150	62	11.60	59.84	54.98	84.5
4	7.56	188	367	252	8.39	73	171	45	10.90	61.49	53.55	82.32
5	7.11	224	374	291	8.09	101	181	44	13.78	55.15	51.74	85.20
6	7.38	159	412	367	8.22	53	194	55	11.39	67.08	53.04	87.22
7	7.18	245	392	392	8.16	80	151	51	13.66	67.62	61.63	87.21
8	7.46	241	369	414	8.31	75	146	74	11.40	69.16	60.59	80.16
9	7.40	249	382	247	8.28	77	163	34	11.75	69.35	57.48	86.57
10	7.31	236	374	279	8.26	99	180	51	12.80	58.80	52.01	86.50

V. CONCLUSION

It can be concluded that orange skin and Aerocon stones show a noticeable improvement of adsorption of oil and greases from polluted water significantly assist in the removal of pH, TDS, BOD, COD, TSS, TDS, DO, hardness, and will improve the physio-chemical quality of the effluent. Multi-media filters are the recent development in the filtration technology which involves the use of multiple media other than the conventional media as opposed to sand used in the conventional sand filters. It can also be concluded from the study that the multimedia filter may be considered as efficient treatment process for domestic wastewater. Also, the above media may enhance the performance of the treatment system. Hence this technology is environment friendly and cost effective. Treated water can be used for Irrigation, toilet flushing, car washing, gardening, firefighting, etc.

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