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Experimental Investigation on Replacement of Filter Media in Wastewater Treatment

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Abstract - *In this paper, we aim to provide a comprehensive overview of multimedia filter technology as a crucial technique for wastewater treatment. Treated water use for Irrigation, restroom flushing, automobile washing, gardening, fire fighting, etc. Filtration technology is the simplest and low-cost treatment technology grounded on the principle of the attached growth process. Multimedia Filters represents a significant enhancement over single media pollutants. A multimedia filter model was developed using Biochar for the treatment of domestic wastewater. Different packing media are used such as Biochar, brickbats, sand, and coconut coir.*

Index Terms – *Biochar, Brickbats, Domestic and wastewater, Filtration, Multimedia Filter.*

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I. INTRODUCTION

Water is considered one of the most important natures on earth. The source of wastewater is obtained from a combination of domestic, industrial, commercial, and agricultural exercises. Wastewater drawn from colorful sources needs to be treated effectively to maintain germ-free surroundings. In general, the primary aim of wastewater treatment is to facilitate the safe disposal of human and industrial effluents without causing harm to the environment. Filtration is a process for removing contaminants from wastewater by passing through the previous medium. It's the simplest and most low-cost treatment technology predicated on the principle of the attached growth process to treat wastewater by removing pollutants like COD, BOD, and total solids. Multimedia pollutants use further than one different type of packing media. The removal of wastewater impurities depends upon the depth of the filter media. The main advantage of the multimedia filtration process is it gives a high discarding rate of wastewater contamination

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II. AIMS AND OBJECTIVES

By developing a multimedia filter for domestic wastewater treatment, the study aims to enhance the conventional wastewater treatment process utilizing a single filter media.

The vital objective of this study is to find the treatment efficiency of domestic wastewater by using multimedia technology and to compare the test results of various parameters in the sample before and after filtration.

III. EXPERIMENTAL SETUP

COLLECTION OF MATERIALS

The adsorbent used for this study is Biochar, Brickbats, Coir, and Sand were collected in the local areas.

PREPARATION OF ADSORBENT:

We started drying the waste in open sunlight for one or two more days after placing it in a muffle furnace up to the temperature of 300 – 500˚C for one hour. The prepared By product contain 50-80% of biochar.

BIO CHAR

SAND

BRICKBATS

FILTRATION MODEL:

The Filtration tank was constructed of glass material. The thickness of the glass is 6mm. The Filtration tank size is 0.45 m long, 0.4 m wide, and 1 m high. The total capacity of the tank is 108 lit/m. The total filter media depth is 0.6m. A collecting chamber is provided at the bottom of the tank. An outlet pipe is provided to collect the sample after filtration. The compartment of the filter medium where various filtering materials are placed.

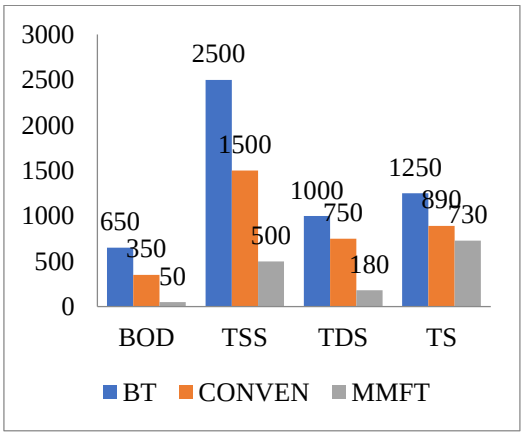
FILTER MODEL

IV. RESULT:

In this study, it was observed that the adsorbent materials such as Biochar, Coconut Coir, and Brickbats may have good efficiency in improving the physical-chemical characteristics of wastewater. The observation reveals that the filter model plays a significant role in effectively removing pH, BOD, TSS, and TDS. The findings indicate that the filter effectively eliminates impurities from domestic wastewater, demonstrating its efficiency in the removal process. The findings of this study demonstrate that the filter utilized is an efficient adsorbent, capable of effectively removing impurities from domestic wastewater and producing treated water suitable for irrigation, gardening, and car washing. From our experiment, the multimedia filter has approximately 80% more effective than the conventional filter.

COMPARISON OF BEFORE TREATMENT, CONVENTIONAL, MULTI-MEDIA FILTER TREATMENT

Si.no	Characteristics	Before treatment values	conventional treatment	Multi media treatment		Efficiency
				Trial 1	Trial 2	
1	Ph	>11.5	>10.5	9	>8.5	26.08%
2	TSS	~2500 mg/lt	~1500 mg/lt	~500 mg/lt	~500 mg/lt	80%
3	TDS	~1000 mg/lt	~750 mg/lt	~180 mg/lt	~180 mg/lt	82%
4	TS	~ 1250 mg/lt	~ 890 mg/lt	~ 730 mg/lt	~ 730 mg/lt	41.6%
5	BOD	650 mg/lt	~ 450mg/lt	~ 75 mg/lt	~ 50 mg/lt	88.46%



BT – Before Treatment
CONVEN –Conventional Treatment
MMFT –Multimedia filter Treatment

V. CONCLUSION

Based on the findings of this study, it can be inferred that low-cost adsorbents demonstrate effective performance in the removal of harmful contaminants from wastewater. The Multimedia filter process gives a good result in the removal of contaminants like pH, Total Solids, Dissolved Solids, Suspended Solids, Biochemical Oxygen demand, chemical oxygen demand, and Dissolved Oxygen from the effluent. In addition, the study determined that the Multimedia filter serves as an efficient pre-treatment method for wastewater. Furthermore, advancements in media types, including porous aerocon stones and synthetic materials, have opened up new avenues for further research and exploration. We suggested that the usage of cellulose pads eliminates backwashing. The usage of biochar will bring additional benefits such as Biochar has a highly porous surface area that allows it to act as a biofilter in wastewater treatment. Treatment of municipal wastewater with

biochar allows for nutrient recovery in the wastewater. Nutrient recoveries of 90% for COD, 89% for TSS, 64% for TKN, and 78% for TP. Treatment of wastewater with biochar allows for pollutants removal in wastewater at the same time can promote sustainable agriculture through the use of nutrient-enriched biochar in soil amendment. The treatment system demonstrates commendable performance with the utilization of low-cost adsorbents. Consequently, this technology proves to be both environmentally friendly and economically viable.

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