International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 08 | Aug 2020 www.irjet.net p-ISSN: 2395-0072

Multi-Layered Charcoal Filtration Technology

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Abstract – *The main objective of this study is to check the performance of charcoal filtration technology for further treatment of domestic wastewater. In this paper, greywater is treated and used for flushing toilets, car washing and irrigation for garden. Here, in multiple layered charcoal filtration setup is provided which includes different sized charcoal layers with variation in depths are considered which shows 66% COD removal when detention period is more in the tank provided for filtration. The main purpose of charcoal use is to check COD removal in laboratory by using COD digester.*

Key Words: multilayered charcoal filter, COD removal, greywater, flushing toilets, car washing, irrigation in garden

1. INTRODUCTION

Water scarcity is one of the major issues in today's world for which everyone is trying to find out the solution. So we need to conserve the pure water or else we have to treat the used water for more use. There are so many modified technologies are developed. Charcoal filtration technology is basically depends upon the process i.e. Adsorption. Adsorption is one of the mostly frequently used process which helps for removal of impurities from liquid i.e. adhesion of the ions &or molecules, atoms from solid, liquid and gases to a surface. In any types of wastewater suspended particles are present which is removed by adsorption method i.e. suspended particles adhered to the pores of charcoal media.

1.1 Charcoal

Charcoal is readily available, affordable and disposable material found in the market. It is produced under pyrolysis process and it is highly porous in the nature. Charcoal filtration works on the basis of adsorption technology which helps to remove contaminants present in the wastewater i.e. contaminants stuck to the pores present in the charcoal. Charcoal is found in the form of powder and granular form. It helps to reduce turbidity, odor, color, suspended solids from the wastewater. Charcoal is a bad conductor of electricity. This is one of the most important property of charcoal.

1.2 Greywater

Greywater is a wastewater which is generated in a house after taking bath, cleaning of utensils in the kitchen. Mainly wastewater has two types i.e. greywater and black water. Greywater mainly contains fewer pathogens compared to domestic wastewater/ black water. So it can be treated and reused again in household external purposes like gardening, flushing toilets and car cleaning.

1.3 Objectives of the study

The main objective of this study is as follows-

1. Develop a setup of charcoal filtration technology by using various sized charcoal and variation in depths in the tank.
2. Find out the COD removal efficiency in a particular detention time.

2. Data collection, procedure and setup

Quantity of charcoal- 15kg
Sizes and depths- From top to bottom
10mm dia. (depth 10cm)-Top
25mm dia. (depth 10cm)-Middle
40 cm dia. (depth 20cm)-bottom

Dimensions of tank – 0.4m (height) and 0.33m (Diameter)
Frequency for application of sample- Once a day
Quantity (batch) of sample passed through filter- 20 liter

Procedure- The sample is passed through the filtration unit slowly so that it allows sample to percolate through the layers and calculate the performance of filter by testing of parameter i.e. COD removal.

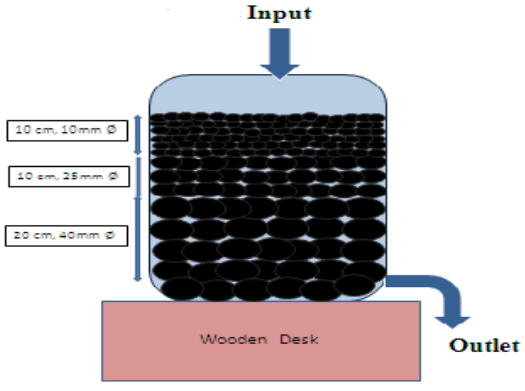

Fig -1: Schematic view of filtration unit

Table -1:

Batch No.	Batch (lit)	COD removal (%)
1	20	22
2	40	30

3	60	25
4	80	42
5	100	53
6	120	66

The samples were collected from collection tank where primary and secondary treatment is completed and treated wastewater is stored and can be used for tertiary treatment.

Here, 20 lit batches are passed through the charcoal filter and COD removal is calculated for every batch. Charcoal filter is first washed and dried in the air and next day it will be used for filtration.

The following graph shows COD removal Efficiency

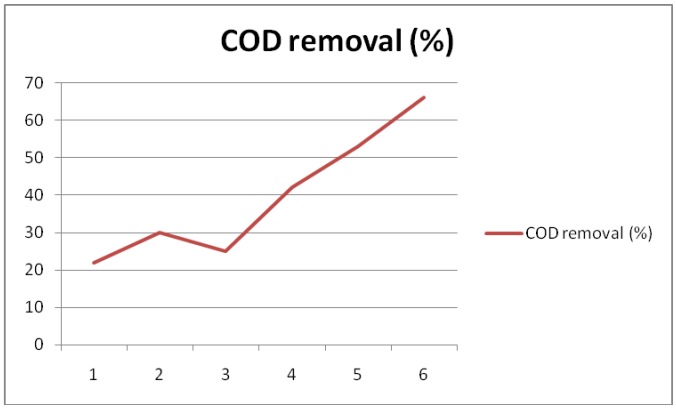

Chart -1

Here in this graph, COD removal efficiency is increased after 3rd batch and it increases up to 66%. It means charcoal filtration technology works after 3rd batch of sample.

Fig -2: Model of filtration unit

Here, the original photograph of tank is shown to understand the main concept of charcoal filtration technology.

3. CONCLUSION

The sample obtained from the charcoal filter is odor free, color free and free from impurities. This treated sample can be used for irrigation in garden, car washing and toilet flushing also. It means that charcoal which is easily available in the market has high degree of purification and can be useful in household level treatments. This technology has wide scope in rural areas.

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