

WASTE WATER TREATMENT UNIT USING ACTIVATED CHARCOAL

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Abstract - The project proposes a grey water Recycling system that will provide water to meet the Needs of the college boy's hostel and irrigation Purpose around the hostel. The water can be used for cleaning and flushing purposes. The grey water Recycling system components were designed and they consist of piping system, diversion system, Filtration and storing system, pumping system and Distribution system. The project includes Underground storage tank, filtration tank and Overhead tank. The filtering media used is activated Charcoal, which is replaced every six months. The Filtered water is stored in underground storage tank for a particular time, then pumped to overhead tank by efficient piping system, and stored there. When the need for water arises, it can be delivered.

Key Words: filtration, activated charcoal, grey Water, recycle.

1. INTRODUCTION

Water scarcity has become a major issue in today's world. The present scenario demands the need of conserving water resources. In addition, there is lot of advanced technologies developed in purifying and recycling wastewater produced. The recycled water is stored in the tank and used whenever the need arises.

The underground water table is low and reducing because of poor rainfall. The rate of natural recharging in the aquifer has become slow due to the low amount of rainfall. In addition, the water in the borehole is diminishing very fast and need for boreholes are increasing. Hence, the process of Purifying and recycling water is the need of the present. Activated charcoal is increasingly used for purifying water. The recycled water can be used for multi purposes.

2. PROPERTIES OF CHARCOAL:

Charcoal is a bad conductor of heat and electricity. The arrangement of amorphous carbon atoms in a non-crystalline, irregular state where there is no free movement of electrons involved. This is responsible for the poor conduction of heat and electricity by charcoal. Charcoal is an amorphous form of carbon, is present as a

powder, and is highly porous in nature. Charcoal density is an additionally important property that almost certainly controls the tendency of chars to sink or float, and to erode or remain on the land surface. Its density can vary between 0.2 and 0.6 t/m³ depending on the density of wood used as raw material. Charcoal produced from hardwood is heavy and strong, whereas produced from softwood is soft and light. The bulk density of charcoal does not only depend on the apparent density but also on the size distribution, and is in the range of 180 - 220 kg/m³. In addition, it should be noted that the absorbing power of most kinds of charcoal increases as the specific gravity increases.

3. OBJECTIVE:

The main objective of this Activated charcoal filtering tank is to meet the water needs of the college boy's hostel. Charcoal is used to remove contaminants and impurities, using chemical adsorption active. Charcoal carbon filters are most effective at removing chlorine, sediment, volatile organic compounds (VOCs), taste and odor from water. The purified water is stored in underground tank. The water is pumped and stored in overhead tanks. The recycled water is used to meet the water needs of the college boy's hostel. The wastewater generated from the boys hostel including water from the bathrooms, kitchen sinks and the laundry is recycled and used for cleaning and other purposes in the hostel.

4. ADVANTAGES OF ACTIVATED CHARCOAL FILTRATING:

Activated carbon is common used to adsorb natural organic compounds, taste and odor compounds, and synthetic organic chemicals in drinking water treatment. The efficiency of the filter is high. The charcoal is used in both granular and powder form. Activated carbon is an effective adsorbent because it is a highly porous material and provides a large surface area to which contaminants may adsorb. In addition to dissolved organics removal, it also removes turbidity and solids removal, and biological stabilization. The charcoal is easily available material and hence the project is economical.

5. DATA COLLECTIONS:

Capacity of Storage Tank = 30,000liters
 Dimension of Filtration Tank = 5m*2.5m*4m
 Dimension of Storage Tank = 7.6m*3.8m*1m

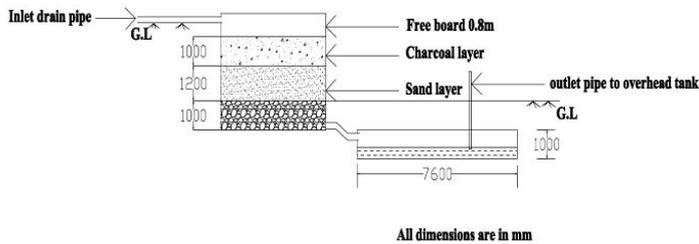


Fig.1. PLAN OF THE FILTRATION TANK

5.1. ANALYSIS OF WASTEWATER OUTFLOW FROM HOSTEL BUILDING:

Peak hours- Morning: 6.00am to 10.00am
 Evening: 5.00pm to 11.00pm

Table -1:

S.no	Date	Morning (Flow) in lit.	Evening (Flow) in lit.	Total Flow/day In lit.
1	14.2.18	806	362	1168
2	15.2.18	627	428	1055
3	16.2.18	646	607	1253
4	17.2.18	750	524	1274
5	18.2.18	780	430	1210
6	19.2.18	743	410	1153
7	20.2.18	672	400	1072
8	21.2.18	748	435	1183
9	22.2.18	835	370	1215
10	23.2.18	763	388	1151
11	24.2.18	812	608	1420

Average Water outflow in one floor = 1200 liters
 (Peak Hours)
 Average Water outflow in one floor = 1500 lit/day
 Total amount of wastewater outflow in hostel is
 = Factor of Safety * no.of floor* amount of water in one floor
 = 1.5*4*1500
 = 10,000liters/day

6. FILTRATION UNIT DETAILS:

Materials: Activated charcoal, coarse aggregate, Fine aggregate.

Top Layer: Activated Charcoal,
 Middle Layer: Fine Aggregate,
 Bottom Layer: Coarse Aggregate.



Fig.2 MODEL OF FILTRATION UNIT

7. PROCESS OF MODEL FILTRATION UNIT:

Collection of Materials
 Cleaning of Materials
 Filing the Materials in Model Filtration Unit

7.1. Collection of Materials:



Fig.3 Materials

7.2. Cleaning of Materials:



Fig.4: Clean the Coarse aggregate



Fig 5: Clean the Fine aggregate



Fig.9: Fill the Activated charcoal in filtration unit

7.3. Filling the materials in model filtration unit:



Fig.6 (a): Filtration unit draining pipe setup (Front view)



Fig.6 (b): Filtration unit draining pipe setup (Top view)



Fig.10: Fill the grey water & Treated water



Fig.7: Fill the Coarse aggregate in filtration unit



Fig.8: Fill the Fine aggregate in filtration unit

8. RESULT OF pH VALUE:

Table 2.

s.no	Types of Water	P ^H range
1	Normal water	6.5 to 7.5
2	Soapy water	8.43
3	Treated water	7.53

For most plants, the optimum pH range is from 5.5 to 7.0, in this treatment process we are acquiring the water about merely to the range of watering the plants.

9. IRRIGATION:

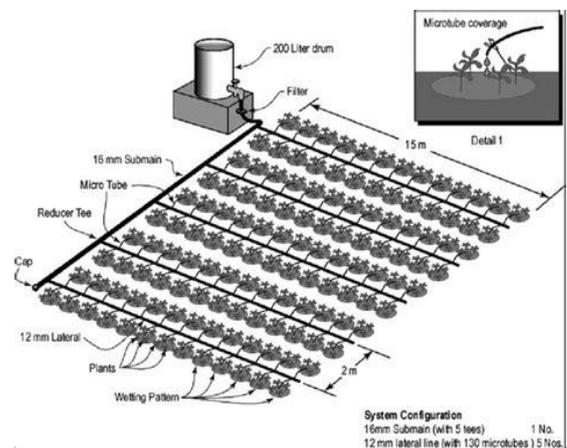


Fig.11 (Drip Irrigation)

10. CONCLUSION:

The water obtained from activated carbon filter is very pure and the water is free from impurities, odor, taste, dissolved solids and turbidity. This method can also be further extended to provide irrigation facility to plants near hostel by drip irrigation. The water has no carbonates and bicarbonates of calcium and magnesium so there is no problem of temporary and permanent hardness and the water can be used for laundry purpose. The fact that the water can also be used for cleaning and flushing purpose is an additional advantage. The rain water can also be effectively collected, stored and distributed. This method of treatment using activated charcoal does not need frequent replacement when compared to the other systems of water treatment. The activated charcoal is easily available, cheap and has high degree of purification. The density and large surface area available for adsorption is an important factor. This process has so many advantages and aimed to meet all the needs of the present situation. The Activated charcoal filtration has a good scope and now being increasingly used in developed nations.

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