

Synthetic Tannery Waste Water Parameter Analysis - before & after treatment by using Activated Carbon as Adsorbent

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ABSTRACT: Tanning industries are required very much for the large requirement of leather products such as shoes, belts, suitcase, wallets & jackets etc., industries are release massive amount of waste. Some small scale industries and not legally registered industries are discharge the waste into the nearby running streams and open lands. The chromium content (Cr (VI) & Cr (III)) in the waste water largely affect the environment. In our research project, for maintaining the hydraulic loading rate, we use Peristaltic pump for continuous flow of waste water, which pumps 50ml/min for 15 rpm. Burned coconut shell used as an adsorbent to minimize the COD strength for prepared synthetic tannery waste water in our research work. For comparative parameter study we test pH, DO, COD.

KEYWORDS: Burned coconut shell-adsorbent-peristaltic pump-COD reduction- pH, DO, COD.

I. INTRODUCTION

The growth of the industries in now-a-days is in unbelievable level. There are various types of industries are run for the production of large materials to day-to-day requirements. In the numerous types, the harmful emission created industries are also included. In till date there are 20 metals are classified as toxic and half of these are present in the environment in sufficient quantities that pose risks to human health. Chromium and its compounds are toxic, which are being mixed with natural water from a variety of industrial effluents. The major sources are from textile dyeing, leather tanning, electroplating and metal finishing industries, as well as from oxidative dyeing and water cooling towers. These are the main reason for the greater pollution of the environment. Because the wastages are discharged into the running streams, the industries use large amount of water during the wet process. After the ending of the process the waste water discharged into the large surface areas and running streams. These waste can create the Clogging to the lands and creates many problems such as respiratory & lungs problems to the peoples. This can create large problems to another living organisms also.

Our project deals with the parameter analysis of prepared synthetic tannery waste water by using burned coconut shell as activated carbon as adsorbent. For the uniform size maintenance we use sieved sand & coal (burned coconut shell) mixture as adsorbing agent. The peristaltic pump is used to maintain the continuous flow of waste water into the container having adsorbing material.

International Journal of Innovative Research in Science, Engineering and Technology

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Vol. 6, Issue 3, March 2017

1.1 ADSORPTION:

Adsorption is the process in which the atoms, ions or molecules from a substance adhere to a surface of the adsorbent. Adsorption is a surface based process where a film of adsorbate is created on the surface while adsorption involved the entire volume of the absorbing substance.

1.2 CHEMICAL OXYGEN DEMAND:

In environmental chemistry, the chemical oxygen demand test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water or wastewater, making COD a useful measure of water quality. It is expressed in milligrams per liter also referred to as ppm, which indicates the mass of oxygen consumed per liter of solution.

1.3 DISSOLVED OXYGEN:

Dissolved Oxygen is known as the amount of oxygen dissolved in a body of water such as a lake, river, or stream. DO is the most important indicator of the health of a water body and its capacity to support a balanced aquatic ecosystem of plants and animals. Wastewater containing organic (oxygen consuming) pollutants depletes the dissolved oxygen and may lead to the death of marine organisms.

1.4 SETTING THE FLOW RATE IN PERISTALTIC PUMP:

The flow rate can be verified by changing the speed using penemeter. The speed of the pump head can be varied from 5 to 100. The approximate flow rate can be selected by , The approximate ml/rev: 1mm I.D - 0.2 ml; 2mm I.D - 0.45 ml; 3mm I.D - 1.0 ml; 4mm I.D - 1.6 ml; 5mm I.D – 2.5 ml. The RPM for the required flow rate can be calculated as follows

$$\text{RPM} = \text{Flow rate (ml/min)} / (\text{ml/rev})$$

II. MATERIALS AND METHOD

The synthetic tannery waste water is treated by using activated carbon with sand. Treatment is conducted by horizontal flow method. The synthetic tannery waste water used throughout the study is prepared as per the table given below. For 1m length of pipe approximately 5 liters of synthetic tannery is to be prepared.

TABLE 1: COMPOSITION OF SYNTHETIC TANNERIES EFFLUENTS

Chemical composition of synthetic Tanneries effluents	(g.L-1)	Chemical composition of synthetic Tanneries effluents	(g.L-1)
Glucose	3.6464	KH ₂ PO ₄	0.088
(NH ₄) ₂ SO ₄	0.91	FeSO ₄ .7H ₂ O	0.02
KCrO ₄	*1.86	MgSO ₄ .7H ₂ O	0.025
CaCl ₂	0.03	FeCl ₃ .H ₂ O	1.5
NaHCO ₃	0.105	H ₃ BO ₃	0.15
Na ₂ CO ₃	0.066	KI	0.03
K ₂ HPO ₄	0.09	MnCl ₂ .4H ₂ O	0.12
Na ₂ MO ₄ .H ₂ O	0.06	ZnSO ₄ .7H ₂ O	0.12
CaCl ₂ .6H ₂ O	0.15	CuSO ₄ .5H ₂ O	0.03

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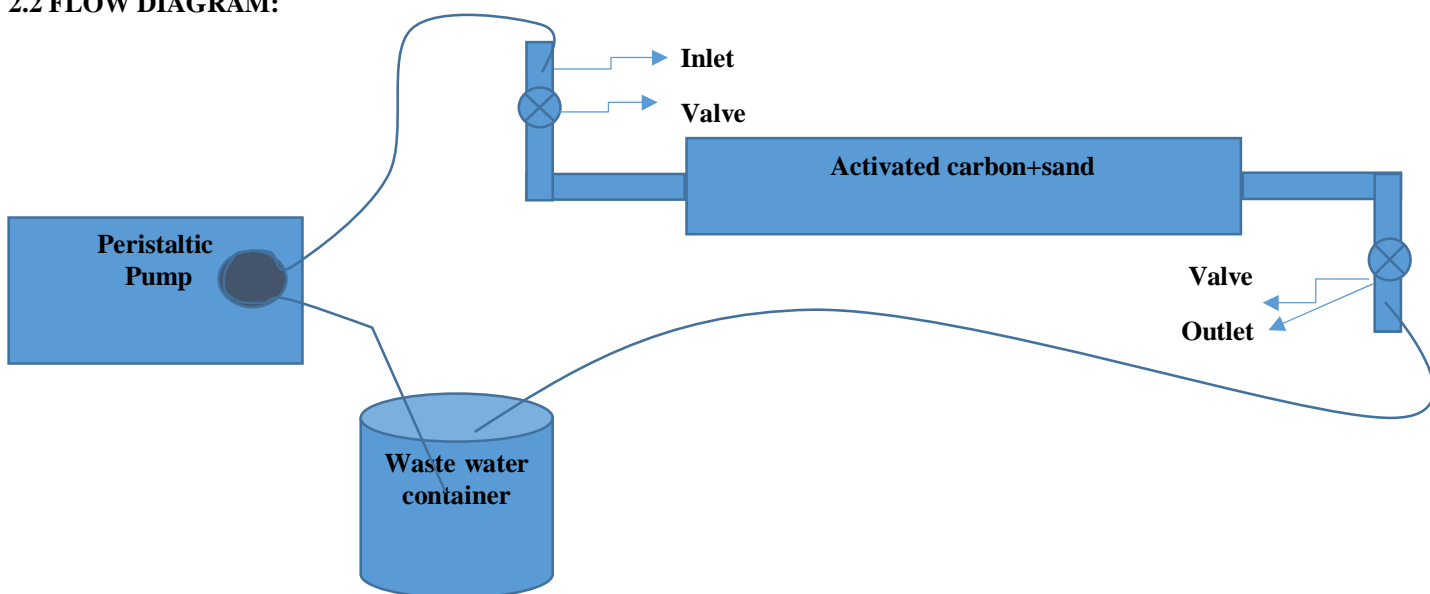
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The samples are collected from the containers properly. The prepared tannery waste used for the test is kept without any organic degradation before treatment. A sufficient quantity of waste water samples was taken from the container periodically. The initial effluent characteristics such as pH, DO and COD were determined in the raw effluent.

After the initial characterization the synthetic tannery waste were treated with Activated Carbon as adsorbent which is mixed with uniform size sand in the ratio of **1:26** (1part activated carbon-26 part sand) for the reduction of chemical oxygen demand. The burned coconut shell is used as an adsorbent.

The treatment was conducted by applying the various rpm levels such as 2,4,6 etc., For the continuous flow of tannery waste the Peristaltic Pump **RH-P120S** is a single channel pump for the use in laboratory and extensively in industrial applications where accurate flow rate is essential. For the different stage of rpm, the waste water parameter such as pH, DO and COD were analyzed. The COD removal efficiencies for the various rpm levels are calculated. The equipments for analyzing pH is **ELICO-LI26** iron analyzer, for DO is **LT-LUTRON model no-DO-5509** and for COD is COD analyzer-IPM-1906 is used.

2.2 FLOW DIAGRAM:



III. RESULTS AND DISCUSSIONS

The characteristics of prepared synthetic tannery was founded as: pH -4.719;DO-3.8 mg/l;TS-13920 mg/l;TDS-12560 mg/l;TSS-1270 mg/l;COD-12800 mg/l;which is given in the table below. The characteristics of synthetic tannery tested for 10 days regularly. The parameters analyzed for the raw of the day before and the present treated wastes are taken for the test. For the ratio of **1:26(activated carbon: sand)** the removal efficiency of the COD is reduced from 12800 mg/l to 9350 mg/l. the pH vales increases from acidic to alkaline its shows the strength of wastewater goes to acceptable limit. Similarly the DO values are also increased from 3.9 mg/l to 5.2 mg/l, and all other parameters such as TS; TDS, TSS are also reduced (11810 – 8250; 10820 – 6800; 1100 – 470) as per our continues characteristic study the above method is suitable for reduction of strength of synthetic tannery waste water.

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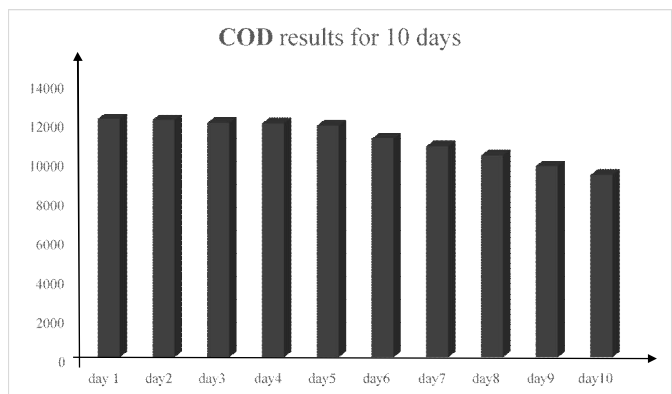
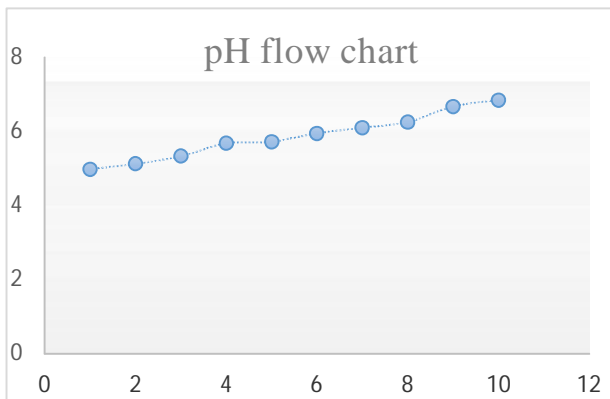
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TABLE: 2 PARAMETER VALUES OF PREPARED SYNTHETIC TANNERY

S.No	Parameter	Values
1.	pH	4.719
2.	DO	3.8(mg/l)
3.	TS	13920(mg/l)
4.	TDS	12560(mg/l)
5.	TSS	1270(mg/l)
6.	COD	12800(mg/l)

TABLE:3 STUDY OF TREATMENT PROCESS:

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
pH	4.980	5.121	5.328	5.676	5.721	5.941	6.097	6.248	6.672	6.840
DO (mg/l)	3.9	3.981	4.021	4.156	4.240	4.456	4.584	4.792	5.012	5.2
TDS (mg/l)	10820	10530	10140	9700	9300	8820	8100	7950	7250	6800
TSS (mg/l)	1100	1050	980	910	860	810	730	640	590	470
TS (mg/l)	11810	11650	11390	10940	10530	10110	9860	9570	8680	8250
COD (mg/l)	12200	12150	12000	11970	11860	11210	10800	10350	9780	9350

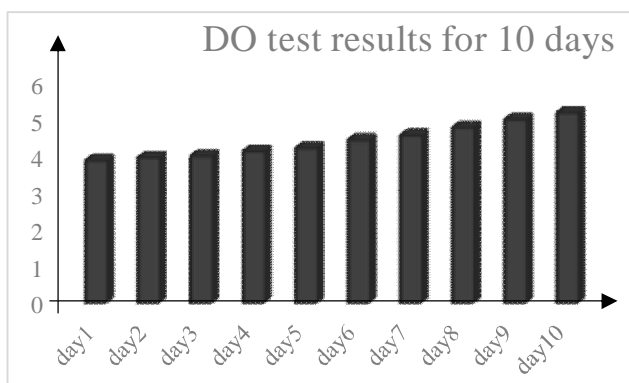


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IV. CONCLUSION

From the results it was identified that the treatment of synthetic tannery waste water using activated carbon and sand (adsorbent+absorbent) the TDS-40.2% ;TSS reduction-6.3% ;TS reduction-35.6% and the reduction of COD was 28.5% was obtained as per 10 days continuous characteristic study. In our study we conclude activated carbon mixed with sand bed filter is one of the best suitable filter media for strength and waste water filtration. If we need the quality as well as quantity of filter water in higher level the HLR and using of different adsorption and absorption materials also suitable for the reduction of strength of waste water.

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