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An Experimental Investigation to Remove Heavy Metals and Colour from Textile Industrial Wastewater Using Activated Carbon of Coconut Coir

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Abstract - Disposal of industrial waste is one of the major problems for soil pollution. These pollutants can cause threat to both human and the environment. It also affects and alter the chemical and biological properties of soil as well the ground water. This causes water pollution also but however lack of accessibility of water due to various factors, humanity is facing a water crisis. So, in order to avoid water deficient future, it has become essential for every country all around the globe to take a step towards water conservation. We take industrial waste water sample from the textile industries, Ballari. In this paper we find out the efficiency of the activated carbon produced by coconut coir.

Key Words: Industrial wastewater, coconut coir, activated carbon, Heavy Materials.

1.INTRODUCTION

Rapid industrialization has caused a huge amount of waste to be produced. These industrial wastes, whether liquid or solid, present significant disposal challenges. Ordinarily, these on land and in bodies of water, waste is disposed of. Land becomes unusable for any other purpose as a result. When hazardous trash is disposed of, the situation is severe since the nearby soil becomes toxic for human activity. To conserve the available water and land resources, alternative methods have been devised. Before being dumped into the environment, this industrial waste needs to be processed. One method of treating water to keep it free from physical contaminants is filtration. Many techniques are available to treat the waste water like chemical, physical and biological treatments. Filtration it is the one of the treatment processes to ensure the water is safe from the biological process. the present study is the ability of coconut husk as absorbent to remove the heavy minerals and colors in industrial wastewater. We focus on to reduce harmful contaminants in industrial wastewater. From the coconut husk it has analyzed to removal of copper, nickel, cadmium. It's also reduction of COD, BOD and extent turbidity. The use of natural materials for filtration process it seems so effective and eco-friendly.

The effectiveness of coconut husk as an adsorbent for color removal depends on various factors, including the characteristics of the wastewater, the concentration and type of colorants, pH levels, contact time, and temperature. Therefore, optimization of these parameters is crucial for achieving efficient color removal. Industrial wastewater filtration process by utilizing Activated Carbon (AC) derived from coconut husk. It is reported that finer grade activated carbon showed the maximum iron removal (95%). It also reported reduction in COD, BOD and to some extent turbidity compared treatment process. We take reference International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249-8958, Volume-8, Issue- 4C, December 2018{1}. On two activated carbons, study of surface area and porosity is performed. According to the results of the water analysis, one type of granular activated carbon will lower the levels of turbidity, total suspended solids, BOD, and COD. However, the water's BOD and COD levels were decreased by ultraviolet radiation.

2.OBEJECTIVES

- To study the effectiveness of coconut husk in filtration process and its characteristics.
- To evaluate the Removal of Suspended Solids in industrial waste water.
- To study the Removal of Dissolved Impurities and Chemical Contaminants.

3. EXPERIMENTAL STUDY

A) Materials Used

a) Well Graded Soil

Well graded soil passing through 4.75mm sieve is used for the initial filtration process. The soil was collected from the campus of RYM Engineering College, Ballari. Soil is placed in the experimental setup according to the sieve sizes.

Fig 1: Well Graded Sand

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b) Coarse Aggregates

Coarse aggregate was collected from the campus of RYM Engineering, Ballari. Coarse aggregate is taken according to uniform sizes i.e., 20mm,10mm,8mm,4.75mm.

Fig 2: Placing of Coarse Aggregates

C) Iron Rods and Steel Mesh

These are collected from the Shankar hardware shop, Ballari. The steel mesh is providing for the filtration purpose and iron rods will provide to resist the weight of the materials placed above the steel mesh.

Fig 3: Steel Mesh and Iron Rods

D)Coconut Coir

The coconut coir was collected from Sri guru Sai provisions stores, Ballari. The coconut coir coconut coir appearance generally in brown. The coconut coir makes into husk and used to prepare activated carbon from this only. Finally, the activated carbon is used for filtration.

Fig 4: Coconut Coir & its Powder Form

B) Preparation of activated carbon

Preparation of activated carbon by using coconut coir steps as follows:

- First take the coconut coir and make into husk, then burned at 600 degree Celsius for 1 hour in muffler furnace.
- Take 100 gm of zinc chloride and mixed with one litre distilled water for 1kg of coconut coir.
- Then the burned material mixed with zinc chloride solution for one hour.
- The mixed components placed in the tray and dried in oven for 24 hours.

Fig 6: Activated Carbon

C)Methodology

For the experiment, 25 liters of water is used. A steel mesh is placed at the bottom for filtration purposes, followed by a top layer of coarse aggregate arranged from largest to smallest in size, well-graded soil, and finally coconut coir and activated carbon. After the water sample collected from the textile industry, Ballari, has passed through the testing apparatus, it is collected from the tap and the effectiveness of activated carbon in removing colour and heavy metals from industrial waste water is assessed. The arrangement shown in the below figure.

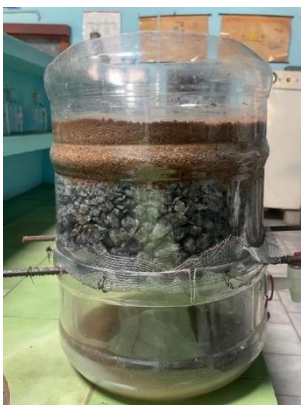

Fig 5: Experimental Setup

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D)Test Performed

a) Test series 1

The water can is fill with coarse aggregates and well graded soil. The test is slightly changing the colour of waste water sample and reducing the chemicals.

Fig 7: Filtration media with coarse aggregate and well graded soil

b) Test series 2

The water can is fill with coarse aggregate and well graded soil as well as coconut coir powder. The coir mainly constitutes of fine organic fiber particles which may supposed to absorb and retain finer particles from the waste water effectively. The coir pith alone consumes more time than the previous tests to get filtered because of the fine organic content.

Fig 8: Filtration with coarse aggregate, well graded soil and coconut coir

c) Test series 3

The water can fill with coarse aggregate and well graded soil as well as activated carbon. This experiment is conducted to compare the effectiveness of activated carbon in filtering the harmful contaminants from waste and efficiency of that compared with coir and sand. This experiment took greater time in filtration compared to the previous experiments.

Fig 9: Filtration with coarse aggregate, well graded soil and activated carbon

4. RESULTS AND DISCUSSION

The following parameters of the filtered sample were studied namely, color, heavy metals and Biological Oxygen Demand (BOD). The chemical testing is done at the pollution MSV Analytical laboratories, Ballari.

a) BOD

The BOD value is most commonly expressed in milligrams of oxygen consumed per liter of sample and is used as a surrogate of the degree of or industrial waste water. Most pristine water will have a 5-day carbonaceous BOD below 1 mg/L. Moderately industrial waste water may have a BOD value in the range of 2 to 8 mg/L. Water sample may be considered severely polluted when BOD values exceed 8 mg/L.

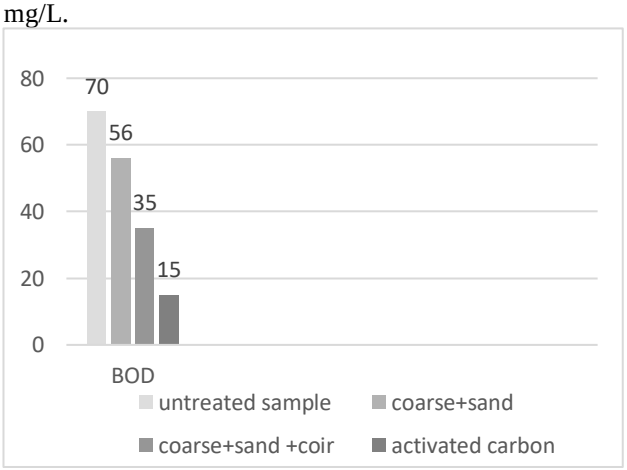

Fig 10: Variation of BOD of filtered water in different filter medias

b) ZINC (Zn)

the zinc concentration in the wastewater sample is calculated based on the calibration curve or factors. The results are typically reported in units such as milligrams per liter (mg/L) or parts per million (ppm) and can be used to assess the compliance of the wastewater with regulatory standards.

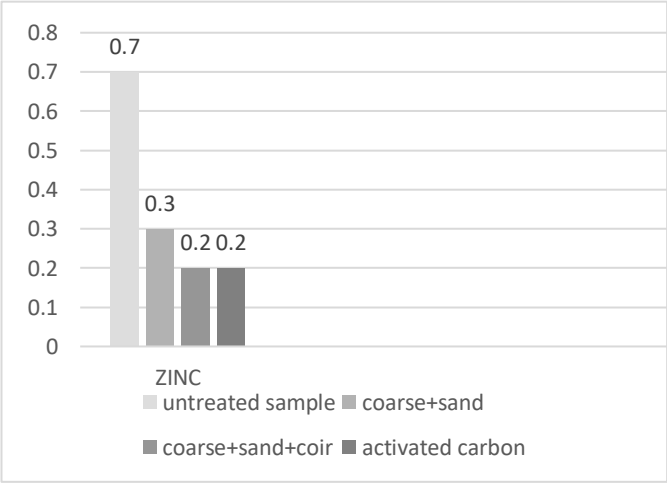

Fig 11: Variation of zinc of filtered water in different filter medias

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c) IRON (Fe)

The most commonly used precipitating agents for iron removal are lime (calcium hydroxide) and coagulants like ferric chloride or aluminum sulfate. These chemicals react with iron, causing it to precipitate as solid particles. The precipitated iron can then be separated through filtration. The for removing iron from wastewater. It involves the use of ion exchange resins that can selectively adsorb iron ions.

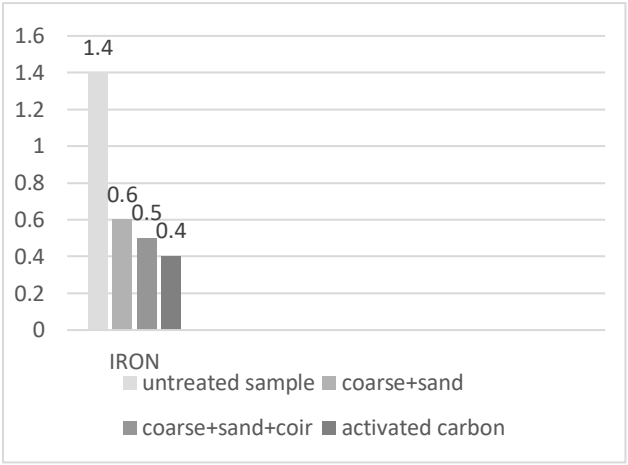

Fig 12: Variation of Iron of filtered water in different filter medias

d) TURBUDITY

This is about turbidity at starting stage the untreated sample was 19.1. later the water sample is treated with coarse aggregate, sand and the value are 15.5 and again sample is treated with coarse aggregate, sand, coir and the value are 8.7 later the sample was treated with activated carbon and the value came was 2.5 these values are shown in above bar graph.

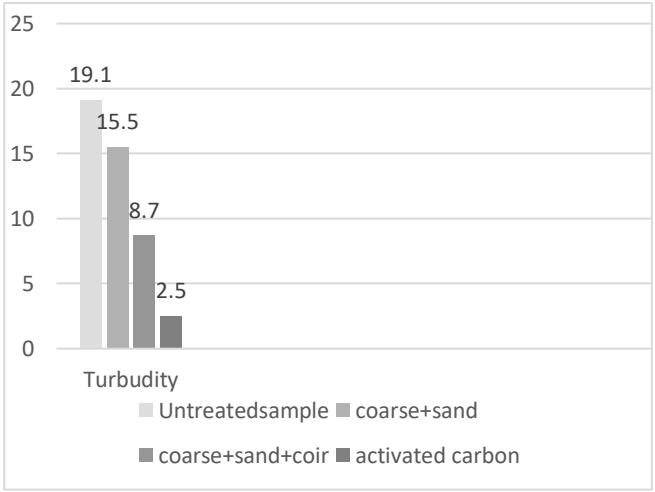

Fig 13: Variation of Turbidity of filtered water in different filter medias

e) COLOUR

This is about color at starting stage the sample was untreated and the value came is 170 later that sample is treated with coarse aggregate, sand and the value came was 170 later the sample is treated with coarse aggregate, sand, coir the value came was 6 and later again the sample is treated with activated carbon the value came was 2.5 as shown in below bar chat.

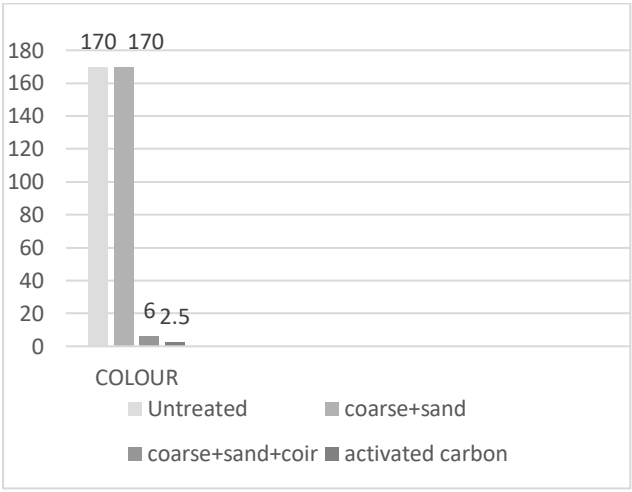

Fig 14: Variation of Colour of filtered water in different filter medias

5. CONCLUSION

The following results were made based on the chemical analysis of effluent filtered through various media: The utilization of natural materials like coconut coir and activated carbon.

- From the filtration and results obtained, it is observed that activated carbon is very effective in removing the BOD, COD, and also brings down the turbidity of waste water to a greater amount.
- The use of activated carbon as a filter media is also observed to be very effective. This introduces an ecofriendly method for filtration and further can reduce the use of chemicals.
- In the filtered samples, the turbidity and colour appear to be decreased. The outcomes demonstrate an entirely new field of use for activated carbon as a filter material.

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