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"Textile industrial waste water treatment by Rice Husk Method"

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Abstract - Treating of waste water in environment engineering is a biggest problem. Textile Industry causes up to 20% of waste water to its total, which is a very big deal. Aquatic animals as well as animals who drink water from rivers or local streams can get affected by it. Hence it is necessary to find a effective and cost saving method to treat it. There are many methods which are introduced for treating the waste water. In this project we are introducing Activated Charcoal Rice husk method. The goal of this project is to treat the Textile Industry waste water and reuse it for various purposes

Key Words**:** Adsorption, activated charcoal, rice husk method, textile industry, waste water treatment

1.INTRODUCTION

Wastewater is any water that has been adversely affected in quality by anthropogenic influence. Wastewater consists of 99.9% water and less than 0.1% waste solids. These solids include dissolved detergents, chemicals, food scraps, dirt, oil, grease, human waste, sand and other small pieces of rubbish. It also includes bacteria and viruses that can make people ill. The various kinds of wastewater, which can be treated by means of natural treatment methods are municipal wastewater, polluted storm water runoff, selected industrial, agricultural and ballast water. Wastewater treatment is done in a series of steps that can have increasing effectiveness and complexity depending on the resources available.

The textile industry is one of the rapidly growing sectors of Indian economy. It uses large volume of water and chemicals at each and every stages of textile processing thereby generating large volume of toxic wastewater. It uses water as the principle medium for applying dyes and finishing agents and removing of impurities. The textile processing industry faces the need to address its responsibility towards a wide range of health and environmental issues, some of which are generic to the industry and some specific to the processes operating in particular cases. The main environmental concern is therefore about the amount of water discharged and the chemical load it carries. The problems specific to the processes poses greater risk to environmental quality in general and water resources and health aspect in particular (Christie, 2007).

1.1 Waste water treatment

1.1.1 Primary treatment

The first step in textile wastewater treatment is the removal of suspended solids, excessive quantities of oil and grease and gritty materials. The wastewater is first screened for coarse suspended materials such as yarns, lint, pieces of fabrics, fibers and rags using bar and fine screens. The screened wastewater then undergoes settling for the removal of the suspended particles. The floating particles are removed by mechanical scraping systems. Neutralization is done to reduce the acidic contents of the wastewater. Primary treatment can reduce BOD by 20 to 30 percent and suspended solids by up to 60 percent.

1.1.2 Secondary treatment

Secondary treatment uses biological processes to catch the dissolved organic matter missed in primary treatment. Microbes consume the organic matter as food, converting it to carbon dioxide, water, and energy. While secondary treatment technologies vary, from the Activated Sludge Process (ASP), Moving Bed Bioreactor (MBBR), Constructed Wetland (CW) systems, Sequential Batch Reactor (SBR) the final phase of each involves an additional settling process to remove more suspended solids. Secondary treatment can remove up to 85 percent of BOD and total suspended solids.

1.1.3 Tertiary treatment

The purpose of tertiary treatment is to provide a final treatment stage to raise the wastewater quality before it is discharged to the receiving environment and to raise the treated water quality to such a level to make it suitable for intended reuse. It includes sedimentation, coagulations, membrane processes, filtration, ion exchange, activated carbon adsorption, electro dialysis, nitrification and denitrification, etc. Tertiary treatment is typically used to remove phosphorous or nitrogen, which cause eutrophication. In some cases, treatment plant operators add chlorine as a disinfectant before discharging the water. All in all, tertiary treatment can remove up to 99 percent of all impurities from sewage, but it is very expensive process.

1.2 Adsorption

Adsorption is a mass transfer process that is a phenomenon of sorption of gases or solutes by solid or liquid surfaces. The adsorption on the solid surface is that the molecules or atoms on the solid surface have residual surface energy due to unbalanced forces. When some substances collide with the solid surface, they are attracted by these unbalanced forces and stay on the solid surface. According to the different adsorption forces, the adsorption process can be divided into two categories: physical adsorption and chemical adsorption.

1.3 Granular Activated Carbon

GAC, also called activated charcoal, or activated coal, or Conventional Activated Carbon (CAC) is a form of carbon processed to have small, low-volume pores that increase the surface area available for adsorption. Due to its high degree of micro porosity, just one gram of GAC has a surface area in excess of 500 m2 (5,400 sq.ft.), as determined by gas adsorption. An activation level sufficient for useful application may be attained solely from high surface area; however, further chemical treatment often enhances adsorption properties. Other low cost adsorbents like coconut shell, orange and banana peels, neem leaves are used as low cost locally available adsorbents.

2. Body of Paper

2.1 Methodology

2.1.1 Materials

Feed water Preparation - The industrial wastewater was collected from Akshay Textiles Bhosari, Pune. Collected wastewater was allowed to settle for 24 hours. The oil/grease layer which was developed at the top of the wastewater was removed after settling. Then water was feed to the storage tank by means of funnel.

Filter media - The column media contains layers of gravel, coarse sand and fine sand having the depths of 50mm and 30mm respectively. The gravels used in column are having size of 10-20mm, the coarse sand is of 4.75-2mm size and fine sand is of 1-0.6mm size.

Activation of Rice Husk - The one kg rice husk is screen with 1mm mesh and wash with water to remove the dirt and sun dried for a day. Then the dried rice husk is soaked in 2.0 mol/L of nitric acid for an hour. Then rinsed with distilled water for 2-3 times and oven dried at 105degree Celsius for 2 hours. The oven dried rice husk is ground and sieved through IS-420um sieve size particle. The name given to the adsorbent is Activated Rice Husk (ARH).

2.2Method

The above materials are arranged in the following manner. Experimental setup is as follow –

Notation	Description
I	Set up For Modified Activated Carbon
II	Set up For Conventional Activated Carbon
A	Storage Tank of Capacity 20 lit.
B	Constant Head Tank of capacity 10 lit.
C	Adsorption Columns

Table 1

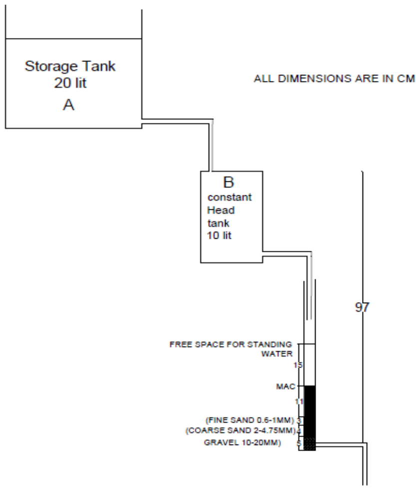


Fig: 1

Collected textile industry waste water is kept in storage tank A and tank B. water is passed through filter media and collected from the outlet.

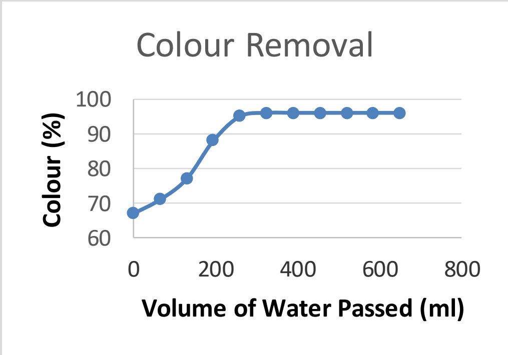
Test for colour, pH, and impurities is done after the test. Filter media is kept same and GAC is changed to MAC. Filter media is washed or reactivated if discharge becomes 0.8 lit/hr.

2.2 Results

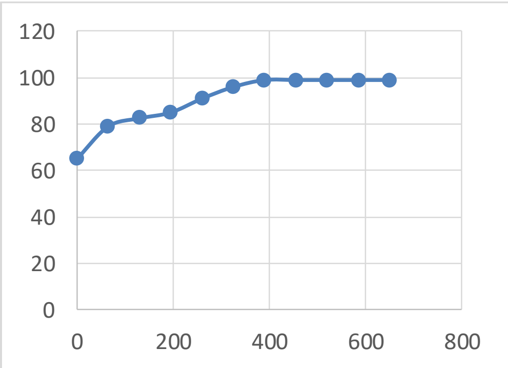
Results were taken after the experiment as below –

Sr.No.	GAC Method		MAC Method	
	Volume of water passed (ml)	Colour (%)	Volume of water passed (ml)	Colour (%)
1.	0	67	0	65
2.	65	71	65	79
3.	130	77	130	82.5
4.	195	88	195	85
5.	260	95	260	91
6.	325	96	325	96
7.	390	96	390	99
8.	455	96	455	99
9.	520	96	520	99
10.	585	96	585	99
11.	650	96	650	99

Table 2



<u>Graph 1</u> - Colour removal (GAC)



<u>Graph 2</u> – Colour removal (MAC)

2.3 Discussion

The remaining water is collected and following test are done -

1. pH – pH paper is used to determine pH.

2. Colour – Digital Colorimeter is used to find the presence or content of dye or colour.

3. Impurities - Sample is taken and compared in the graduated cylinder

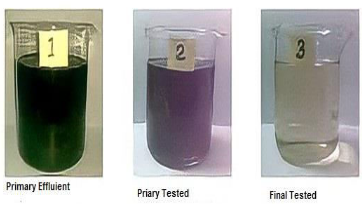


Fig 2 : Waste water before and after treatment

CONCLUSIONS

1. The efficiency of GAC is up to 70% to 95% in colour removal up to the throughput volume of 390 ml.

2. The efficiency of MAC is up to 78% to 98% in colour removal up to the throughput volume of 390ml. after that is no significant removal in colour.

2. The colour removal efficiency in case of standing water is 3-5% greater than the case of without standing water in MAC.

3.The systems is independent of pH.

4. The efficiency of colour removal decreases up to 10-13% as per flow rate increases up to 2 lit/hr. in the both cases of GAC and MAC.

5. 70-80% of reduction of the total impurities.

6. All the treated water is mixed and pH is neutralized.

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