



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com

Industrial Wastewater Treatment by Rice Husk Method

Prof. Ashok more¹, Shweta Sawant², Roshani Daulkar², Adarsh Patil², Ajay Jogade²

Professor, Department of Civil Engineering, D.Y. Patil College of Engineering, Akurdi, Pune, Maharashtra, India ¹

Final Year B.E Student, Department of Civil Engineering, D.Y. Patil College of Engineering, Akurdi, Pune, Maharashtra, India²

ABSTRACT: Treating wastewater in environmental engineering is the biggest problem. Textile Industry causes up to 20% of wastewater to total, which is a huge deal. Aquatic animals and animals who drink water from rivers or local streams can be affected. Hence it is necessary to find an effective and cost-saving method to treat it. Many ways are introduced for treating wastewater. In this project, we are introducing the Activated Charcoal Rice husk method. This project aims to treat the Textile Industry wastewater and reuse it for various purposes.

I. INTRODUCTION

Cementconcrete 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 rubbish pieces. It also contains bacteria and viruses that can make people ill. The various kinds of wastewater, which can be treated using natural treatment methods, are municipal wastewater, polluted stormwater runoff, and selected industrial, agricultural and ballast water. Wastewater treatment is done in a series of steps that can have increased effectiveness and complexity depending on the resources available.

The textile industry is one of the rapidly growing sectors of the Indian economy. It uses a large volume of water and chemicals at every stage of textile processing, thereby generating a large volume of toxic wastewater. It uses water as the principal medium for applying dyes and finishing agents and removing impurities. The textile processing industry faces the need to address 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. Therefore, the main environmental concern is the amount of water discharged and the chemical load it carries. The problems specific to the processes poses a greater risk to environmental quality in general and water resources and health aspect in particular (Christie, 2007).

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 broken materials such as yarns, lint, pieces of fabrics, fibres and rags using a bar and fine screens. The screened wastewater then undergoes settling for the removal of the suspended particles. Mechanical scraping systems remove the floating particles. Neutralization is done to reduce the acidic contents of the wastewater. Primary treatment can reduce BOD by 20 to 30 and suspended solids by up to 60 %.

2. Secondary Treatment

Secondary treatment uses biological processes to catch the dissolved organic matter missed in primary treatment. Microbes consume 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 % of BOD and total suspended solids.

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 raise the treated water quality to such a level to make it suitable for intended reuse. It includes sedimentation, coagulation, membrane processes, filtration, ion exchange, activated carbon adsorption, electrodialysis, nitrification and denitrification, etc. Tertiary treatment is typically used to remove phosphorous or nitrogen, which causes eutrophication. Treatment plant operators sometimes add chlorine as a

disinfectant before discharging the water. All in all, tertiary treatment can remove up to 99 per cent of all impurities from sewage, but it is a costly process.



Textile wastewater may require tertiary or advanced treatment methods to remove particular contaminants or prepare the treated effluent for reuse. This treatment implies the removal of a high percentage of colloidal solids by disinfection. About 15% of the total world production of dyes is lost during the dyeing process and is released as liquid effluents among the various types of shade. Different cationic dyes, including methylene blue, are used in coloring, paint production and wool dyeing. The effluent containing dyes are highly colored, resulting in significant environmental problems. Wastewater from the textile industry can contain various polluting substances, including paints.

Methodology

Adsorption occupies the most important position among the unit operation in wastewater treatment. It exploits the ability of certain solids preferentially to concentrate the specific substances from the solution onto their surfaces. It includes selective transfer to the surface and forms the bulk liquid.

The relationships between some of its parameters can be studied to enhance the filtration quality and avoid some of the drawbacks of adsorption. An attempt was made to explore the relationship between various parameters to overcome the weaknesses through experimentation.

III. MATERIALS AND METHODS

1) Feedwater preparation

The industrial wastewater was collected from Deccan Finishers, Ichalkaranji. Collected wastewater was allowed to settle for 24 hours. The oil/grease layer developed at the top of the wastewater was removed after settling. Then the supernatant was fed to the storage tank using a funnel.

2) Media

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

a) Sieve analysis

The sieve analysis was done to prepare fine sand. The sieves used for analysis were sizes 0.592mm, 0.295mm, 0.152mm and 0.074mm. The river sand was sieved through a one mm size sieve to prepare fine sand. As per sieve analysis, the adequate size (D₁₀), coefficient of uniformity ($C_u = D_{60}/D_{10}$) and coefficient of curvature ($C_c = D_{230}/(D_{10} \cdot D_{60})$) of fine sand were calculated. The D₁₀ of fine sand obtained was 0.17mm (0.15-0.3mm), C_u obtained was 3 (less than 5), and C_c was 1.36 (1-3), which indicates the acceptable media to be utilized in CBSF. The sieved gravel of 6-15mm size and coarse sand of 3-6mm size were used.

The filter media was thoroughly washed with water to remove sticky particles, sun-dried and used; the sun-dried gravel, coarse gravel, and fine sand of 50mm, 35mm and 180mm were provided one above the other from the bottom of CBSF, respectively.

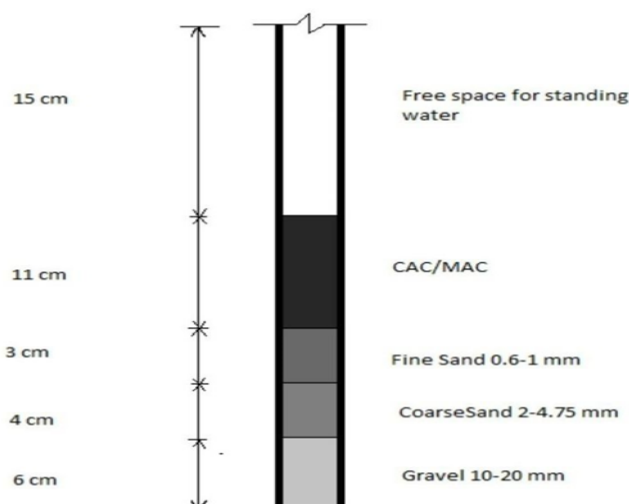
3) Activation of Rice Husk

The one kg rice husk is screened with 1mm mesh and washed 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 and then rinsed 2-3 times with distilled water

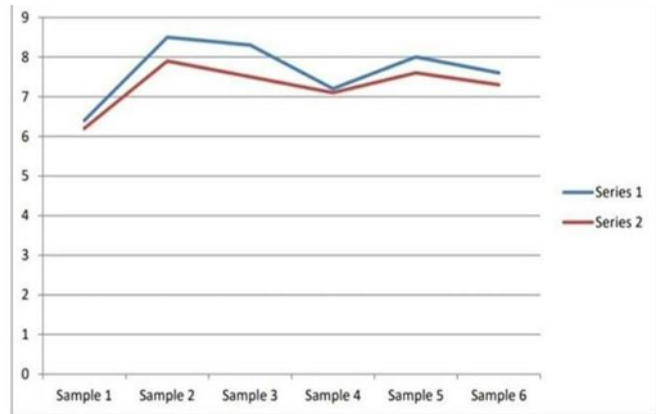
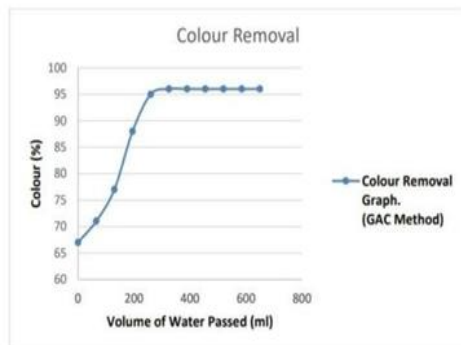
and oven-dried at 105°C for 2 hours. The oven-dried rice husk is ground and sieved through IS-420µm sieve size particles. The name given to the adsorbent is Activated Rice Husk (ARH).

Experimental Procedure:-

- I. Initially, the feed water is fed to the adsorption column using an overhead storage tank of 20 lit. Capacity is used with the required flow rate.
- II. The feed water is allowed to tank B of 10 lit. Capacity through valves of 20mm dia. Which is fully opened always.
- III. tank B contains an outlet tap of 15mm diameter at the bottom of the tank. The fixture was set with a reducer to maintain the flow rate.
- IV. During feeding period of 5 min. The outlet of the adsorption column is closed till we get the standing water of 15cm above the filter media with 92cm head.
- V. The outlet for the adsorption column was opened when 15cm of standing water. The HRT for feed water was fixed as 5min. and the flow rate was calculated in lit/hr. as 0.8lit/hr.
- VI. Initial readings are taken without maintaining standing water in the column and then keeping standing water with the proper adjustment of tap provided. A method for adjusting the fixture was trial and error. The 16 samples for color removal determination are taken without constant head and for with regular authority are, 16 samples are taken.
- VII. Then, the color removal in each sample was found using a digital calorimeter.
- VIII. Measure the pH with the help of pH paper.
- IX. Impurities are compared with the help of a graduated cylinder.



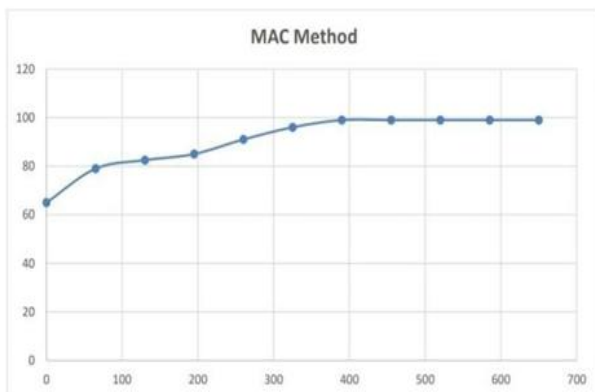
OBSERVATIONS AND RESULTS



Graph – Initial and Final values of pH

Results

pH Values:



Sr.No	pH Value (Initial)	pH Value (Final)
1.	6.4	6.2
2.	8.5	7.9
3.	8.3	7.5
4.	7.2	7.1
5.	8	7.6
6.	7.6	7.3

In this experiment industrial water is taken for experimental purposes. Water is kept flowing to the filter media. The remaining water is collected and the following tests are done: -

1. pH – pH paper is used to determine ph.
2. Color – Digital Colorimeter is used to find the presence or content of die or color.
3. Impurities - sample is taken and compared in the graduated cylinder.

Readings taken with colorimeter-

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



Primary Effluent



Priary Tested



Final Tested

ADVANTAGES AND DISADVANTAGES**ADVANTAGES**

- The locally available material is used.
- The construction cost of the setup is low.
- Water can be reused for irrigation when a more extensive arrangement is made.
- Experiments can be carried out efficiently, and skill is not required.
- Impurities can be reduced in somewhat amounts.
- Textile water cannot be thrown into oceans or rivers that are beneficial for aquatic animals.
- The harmful dye which can cause disease is removed up to 65% - 83%.

DIS-ADVANTAGES:

- 100% of color removal is not assured.
- Removal of filter media for washing repeatedly.
- pH is not reduced or maintained in this method.
- The method takes time to treat wastewater.
- Proper care is to be taken while making the setup of the instrument.

Applications

- 1) To study the efficiency of MAC with varying various related parameters like initial concentration of influent, depth of media dimensions of adsorption column, flow rate, contact time between the adsorbent and wastewater, sewage head etc. the efficiency of MAC may increase or vary with an increase or decrease in parameters.
- 2) To study the effect of varying pH, by changing the sizes of GAC and MAC, we can use both GAC and MAC in combination. Also, we can produce the MAC with another material.

IV. CONCLUSIONS

1. The efficiency of MAC is up to 78% to 98% in color removal up to the throughput volume of 390ml. After that is no effective removal in color.
2. The color removal efficiency in the case of standing water is 3-5% greater than the case without standing water in MAC.
3. The system is independent of ph.



4. The efficiency of color removal decreases up to 10-13% as per flow rate increases up to 2 lit/hr., in 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.

REFERENCES

1. Brower GR, Reed GD. "Economical pre-treatment for colour removal from textile dye wastes. "In Proc. 41st in the waste conference, Purdue University: West Lafayette, Indiana.
2. Halliday, P. J., Besets, S. "Surface and adsorptive properties of carbons prepared from biomass" Applied Surface Science, 252(1986), 287-295.
3. PANSWAD, T; WONGCHAI SUWAN, S "Mechanisms of dye wastewater colour removal by magnesium carbonate-hydrated basic water" SciTech, (1986) 18,139.
4. Balasubramanian, R.H., V.G. Bhandarkar and V. Sundaram "Large-scale digestion of willow dust in batch digesters" Biological Wastes, 25(1) (1988): 25-32.
5. Carlill C. "Anaerobic decolourisation of active dyes in conventional sewage treatment processes" ISSN 0378-4738=Water SA (1994) Vol. 20 No. 4
6. Basibuyuk M. and C.F. Forster "The use of sequential anaerobic/aerobic processes for the bio-treatment of a simulated dyeing wastewater" Environ. Technol. 18(1996) : 843-84 .
7. MARROT B., N. ROCHE, "Wastewater treatment and reuse in textile industries, a review", Research Advances in Water Research, (2002)vol. 3, pp. 41-53.
8. Kannan, M Sundaram, M M: "Adsorption of Congo red on various activated carbon-a comparative study" Water Air Soil Pollution (2002), 138.
9. Bisschops and Spanjers "Literature review on textile wastewater characterisation" Environ Technology Nov;24 2003 (11):1399-411.
10. Lemke A.E. Bisschops "The contribution of biotic and abiotic processes during azo dye reduction in anaerobic sludge" Water research vol. Thirty-seven pages 3098-3109.
11. Malik PK "Use of activated carbons prepared from sawdust and rice husk for adsorption of acid dyes "a case study Dyes and Pigments (2003) 239–249 Volume 56, Issue 3.
12. Malik, P.K., and S.K. Sanyal. "Kinetics of decolourisation of azo dyes in wastewater by UV/H₂O₂ process" Sep.2004 PurifTechnol. 36:167-175.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details