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Removal of Oil Industry Wastewater Using Rice Husk asAdsorbent

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Abstract

The wastewater from industries varies so greatly in both flow and proportional strength. Industrial wastewater may contain suspended, colloidal, minerals and organic solids. In a typical wastewater treatment flow sheet used by several industrial units in India primary treatment, Secondary treatment and Tertiary treatment are various stages of treatment. The use of Rice Husk as adsorbent for the removal of COD and oil & grease wastewater has been explored in a laboratory scale experiment. The Rice Husk used for the present work was treated with alkali to increase the adsorption properties.

Keywords: *Oil Industry, Wastewater, Adsorbent, Rice Husk*

INTRODUCTION

India is the fourth largest oil seed producing country in the world, next only to USA, China, Brazil, harvesting about 25 million tons of oilseeds against the world production of 250 million tons per annum. Many varieties of oil seeds along with tree origin oilseeds are cultivated in India. India occupies the place of pride as the world's largest producer of Groundnuts, Sesame seeds, Linseeds and Castor seeds. In India, oilseeds are grown in an area of nearly 27 million hectares across the length and breadth of the country. Depending on the period of cultivation, the oilseeds are classified as 'Kharif Crop' and 'Rabi Crop'. Many technological processes are carried out in order to obtain refined vegetable oils from seeds. The main processes include pretreatment of oilseeds, manufacturing, refining and modification of oils. During these processes by-products and wastewater are formed. Over the last few decades adsorption has gained

importance as a most useful in purification and separation process on an industrial scale. The present work is carried out in Maheshwari Solvent Plant, Khamari Dist. Gondia which is 6 km from Gondia in M.S. that includes working the Removal of COD and oil & grease using adsorption process.

MATERIALS AND METHODS

Removal of various pollutants from wastewater by adsorption technique using various adsorbents was also carried out. Treatability studies performed on the wastewater using adsorption process. Feasibility of adsorption treatment for oil and grease and COD removal

Effect of pH- Various standard flask and 400 ml of sample with 15gm of Rice Husk adsorbent was taken in each flask having pH 8, 9, 10 resp. Then it was kept in flocculator machine for mixing (shaking) and agitated for time intervals 120 minute (i.e. two hour intervals). After the predetermined time intervals, the samples were withdrawn from the mixer and then supernatant was collected and treated for COD and Oil and grease concentration.

Adsorbent -The adsorbent used for the experiments was rice-husk by product of rice industry. In Gondia, there are so many rice industries situated nearby in town and small villages, therefore, the rice husk made easily available adsorbent which is most effective adsorbent for the removal of COD and Oil and Grease from the wastewater sample. Fresh rice husk is taken from Ganesh Rice Mill, Amburla, Balaghat road, Gondia.

Rice Husk- Rice husk is an agriculture residue abundantly available in rice producing countries. The annual rice husk produce in India amounts is generally approximate 12 million tones. Rice Husk is generally not recommended as cattle feed since its cellulose and other sugar contents are low. Rice bran oil is extracted from rice husk. Industries are used rice husk as a fuel in boilers and for power generations. Among the different types of biomass used for gasification, Rice Husk has a high ash content vary from 18 to 20%.

Silica is the major constitute of rice husk. India is the 2nd largest producer of rice, next is China. Rice Husk is the only agro residue having maximum siliceous ash content and available in dry form. Rice is one of the major crops in India. About 22 million tons of rice-husk is produced annually as a byproduct from Rice-Milling in India. Rice husk is abrasive in nature,

and has low nutritive value, low bulk density and high ash content. Bhandara/Gondia district also well known for 'Bowl of Rice. About 400 Rice Mills are available in Gondia district.

The Rice Husk has a high ash content of about 20% consisting of mainly of amorphous biogenic silica. Following are the properties of rice husk in tabulate forms which are used in table no.1.

Table no .1

Composition of Rice husk	**(wt.%)**
Moisture	9.00
Volatile Matter	55.00
Fixed Carbon	15.00
Ash	23.00

RESULT AND DISCUSSION

The adsorption study is to determine the effect of pH for the removal of COD and oil & grease. The observations are given in table for the four days.

Effect of pH in Adsorption Process [Adsorbent Dose = 15gm & Contact Time=120 min.]

Table no.2

First day

pH	Before treatment (Raw)		After treatment (Treated)		% Removal	
	COD	Oil & grease	COD	Oil & grease	COD	Oil & grease
8	7200	437	5280	279	26.67	36.16
9	7520	431	5120	265	31.91	38.51
10	7360	428	5440	271	26.08	36.68

Second day,

Table:-3

pH	Before treatment (Raw)		After treatment (Treated)		% Removal	
	COD	Oil & grease	COD	Oil & grease	COD	Oil & grease
8	5400	525	3360	378	38.23	28.00
9	5600	529	4000	371	28.57	29.87
10	5280	538	3840	360	27.27	33.09

Third day,

Table:-4

pH	Before treatment (Raw)		After treatment (Treated)		% Removal	
	COD	Oil & grease	COD	Oil & grease	COD	Oil & grease
8	7360	429	4800	338	34.78	31.30
9	7668	496	4480	322	41.57	35.08
10	7200	480	4960	340	31.11	29.17

Fourth day,

Table no. 5

pH	Before treatment (Raw)		After treatment (Treated)		% Removal	
	COD	Oil & grease	COD	Oil & grease	COD	Oil & grease
8	6080	393	4640	245	23.68	37.65
9	6240	402	4160	251	33.33	37.56
10	6720	420	4000	260	40.47	38.09

COD

- It is observed while first trial was carried out for the removal of COD from wastewater sample it was observed that maximum percentage of removal efficiency was achieved to be 31.91%.

- It is observed while second trial was carried out for the removal of COD from wastewater sample it was observed that maximum percentage of removal efficiency was achieved to be 38.23%.

- It is observed while third trial was carried out for the removal of COD from wastewater sample it was observed that maximum percentage of removal efficiency was achieved to be 35.08%.

- It is observed while fourth trial was carried out for the removal of COD from wastewater sample it was observed that maximum percentage of removal efficiency was achieved to be 40.47%.

Oil and Grease

- It is observed while first trial was carried out for the removal of oil and grease from was sample it was observed that maximum percentage of removal efficiency was achieved to be 38.51%.

- It is observed while second trial was carried out for the removal of oil and grease from was sample it was observed that maximum percentage of

removal efficiency was achieved to be 33.09%.

- It is observed while third trial was carried out for the removal of oil and grease from was sample it was observed that maximum percentage of removal efficiency was achieved to be 35.08%

- It is observed while fourth trial was carried out for the removal of oil and grease from was sample it was observed that maximum percentage of removal efficiency was achieved to be 38.09%.

CONCLUSION

Adsorption is carried out to find out the percentage removal of COD and Oil and Grease using Rice Husk as adsorbent for 120 min. contact time and 15 gm adsorbent dose and it is concluded that the pH of 10, 9 and 8 there was very small difference in the percentage removal of different pollutants. It indicates that pH does not affect the removal of COD and Oil and Grease. Further work is needed by reducing pH to lesser value to understand the effect of pH.

REFERENCES

1. Bernardes, R.S. and Klapwijk, A. (1996), "Biological Nutrient Removal in a SBR Treating Domestic Wastewater", Water Science Technology,33:29-38.

2. Davis, W.B. and Irvine, R.L. (1971), "Use of Sequencing Batch Reactor. For Wastewater Treatment" – CPC International, Corpus Christi, TX. Presented at the 26th Annual Industrial Waste Conference, Purdue, University, and West Lafayette, IN.

3. Juan C.T. and Ouyang, C.F. (1995), "A Study of a Modified Process for the Intermittent Cycle Extended Aeration System", Water Science Technology, 31:173-180.

4. Kargi, F. and Uygur, A. (2003), "Nutrient Loading Rate effects on nutrient removal in a five – step Sequencing Batch Reactor". Process Biochem, 39:507-512.

5. Ketchum L.H. and Umble, A.K. (1997), "A Strategy for Coupling Municipal Wastewater Treatment using the SBR with Effluent Nutrient Recovery through

Aquaculture", Water Sci. Technology, 35: 177-184.

6. Metcalf and Eddy, "Wastewater Engineering Treatment, disposal reuse", Tata McGraw Hill Publishing Co., New Delhi, Fourth edition.

7. Mace, S. and Mata-Alvarez J.R. (2002), "Utilization of SBR Technology for Wastewater Treatment": an overview. Ind. Eng. Chem. Rem. Res., 41:5539-5553.

8. Norcross, K.L. (1992), "Sequancing Batch Reactors – An Overview". Water Science and Technology, vol.26: 9-11.

9. Qian, Y., Wang, J. and Wen, X. (2004), "Study on Performance Characteristics of SBR under limited dissolved Oxygen". Process Biochem., 40:293-296.