ANALYSING THE CHANGE IN CHARACTERISTIC BEHAVIOUR OF DAIRY EFFLUENT USING RICE HUSK AS AN ADSORBENT

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A B S T R A C T

Dairy Effluent is one of the major foods processing Industry generating a huge quantity of wastewater. The dairy effluent was collected from the outfall of the dairy industry located in our Madurai City.The initial characteristics such as pH,Total Dissolved Solids(TDS),Total Suspended Solids(TSS), Biochemical Oxidation Demand (BOD) & Chemical Oxidation Demand (COD) were observed. An experimental setup of a prototype model was installed in the laboratory comprising of Skimming tank, Sedimentation tank, Aeration tank &Filtering unit.This filtering unit consists of three layers comprising of CoarseAggregate, Fine Aggregate & the adsorbent. The dairy effluent was allowed to flow through the treatment units and the output from the filtering unit was collected. The samples were collected from the outlet of the treatment unit and this was tested in the laboratory and then compared with the initial characteristics of the effluent. By varying the depth of adsorbent media from 0.5 cm to 2cm at an interval of 0.5cmthe treatment efficiency at different depths were observed and compared.

Index Terms - Dairy Waste Water,Adsorbent,Rice Husk,pH,COD,BOD,TSS.

I.Introduction

The dairy industry is generally considered as the largest source of food processing wastewater. Milk is an important component of food all over the world Particularly in India milk and milkproduct are considered to be essential constituent of food. Hence Dairy industry is an essential part of every humancommunity with increase in demand for milk and milk products, many dairies industries came into the picture. The dairy effluent contains a high concentration of organic materials, and all these components contribute largely towards their high values of biological oxygen demand (BOD), increased rates of chemical oxygen demand (COD), high concentration of suspended solid sand oil greases, , lactose, and fats in addition to inorganic salts, besides detergents, sanitizer. The effluents coming out of Dairy Industry needs to be treated properly before the disposal. The treated effluent must be

monitored periodically and they should be within the prescribedlimits so as to control any possible environmental pollution.
Characteristics of waste from dairy industry
i) High Dissolved Solids
ii) High Suspended Solids
iii) High BOD
iv) Phosphorus
v) Nitrogen
vi) Oil and grease

Present study focuses on using Rice Husk, which is basically the waste usually fed to cattle's, was used as an absorbent for treating the dairy industry effluent.Clean water provides the foundation for prosperous life and communities. These industrial activities indirectly overload water body with thousands of water pollutants.

II.*Experimental Methodology*

2.1 Collection of dairy effluent

Wastewater samples were collected from the outfall of a dairy industry in Madurai city. Waste water sample collected from the plant was placed in containers to be transported to the laboratory and stored at refrigerator. pH,Total Dissolved Solids(TDS),Total Suspended Solids(TSS),Biochemical Oxidation Demand (BOD) & Chemical Oxidation Demand (COD) were analyzed in the laboratory as per the given standard guidelines and the results obtained were shown in the below table 1

Table 1 Characteristics of dairy effluent

Parameters	Values Obtained
pH	5.85
TDS	570mg /L
TSS	918 mg /L
BOD	217 mg/L
COD	452 mg/L

2.1 Adsorbent Preparation

The rice husk used was obtained from nearby rice mill. It was washed twice with distilled water to removethe dust and soluble impurities.The adsorbent was then keptin the muffle furnace for a period of 30 minutes at a temperature of 250° C. It was then allowed to cool down at room temperature.

2.1.1Adsorbent Media

The experimental batch study was carried out by increasing the depth of adsorbent media in a varying proportion of 0.5cm,1.0cm,1.5cm,2.0cm.The adsorbent was evenly spread on the surface as a filtering media for the subsequent treatment process.

2.2 Experimental Batch setup

The experimental batch study was conducted as a prototype model in the laboratory by providing the various treatment units as shown in the figure 2.2thus enhancing the efficiency of treatment process. The treatment was carried out by providing a skimming tank, to remove the oil and grease presented in the dairy effluent. After the removal of oil and grease the effluent is then allowed to flow towards the sedimentation tank. The suspended solids presented in the effluent were allowed to settle down in the sedimentation tank thus keeping a detention period of 15 minutes. The effluent is then allowed to pass through the aeration chamber to remove the dissolved gases and to increase the dissolved oxygen level. The aeration process was carried out for a period of 10 minutes. After aeration the effluent is allowed to pass through the filtering unit where the adsorbent is used for treatment. The filtering unit consists of 3 layers having the bottom most layers filled with coarse aggregate, middle layer with fine aggregate and then the adsorbent (filtering media) supported on the semi permeable membrane.

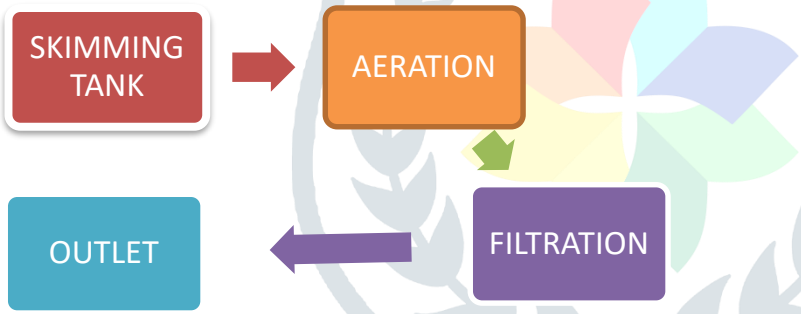

Fig 2.2 Experimental Batch Setup

III.RESULTS AND DISCUSSIONS

3.1 Effect of Rice husk on pH of the sample

Theinitial pH of the sample was found to be 5.85. When it was allowed to pass through the adsorbent media i.erice husk the removal efficiency of the organic matter was found to be high at a lower value of pH.The removal of organic matter shows no significant changes at a higher value of pH.

3.2 Effect of Rice husk on TDS of the sample

Total Dissolved Solids present in the Dairy wastewater was 570mg/L and on the usage of Rice husk shows an adequate removal of dissolved solids. It was observed that 75% of dissolved solids were removed by the adsorbent provided at a thickness of 0.5cm depth

respectively. The variation of TDS is accordingly to the depth of the adsorbent media is shown in Fig3.2.

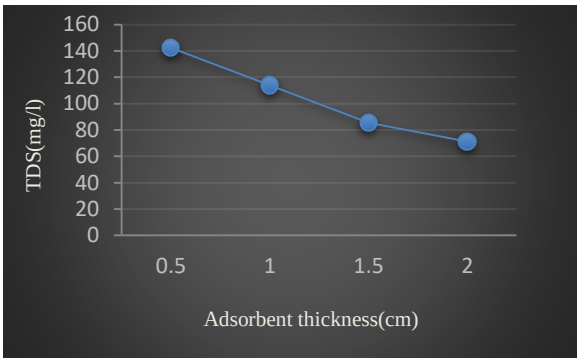

Fig 3.2 TDS variation in the Effluent

3.3 Effect of Rice husk on TSS of the sample

Total Suspended Solids present in the Dairy wastewater was 918mg/l and on the usage of Rice husk the removal efficiency was so efficient. The removal efficiency ranges was almost 85% at a thickness of 2cm depth. The variation of Total suspended solids with respect to the adsorbent thickness were shown in the Fig 3.3

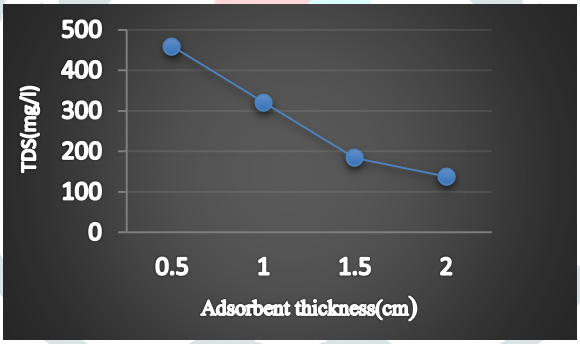

Fig 3.3TDS variation in the Effluent

3.4 Effect of Rice husk on BOD of the sample

BOD concentrations of the sample were changed after the passage in the adsorbent media at different dosages. Initial BOD of the untreated sample was 217mg/l. The BOD removal for various dosages varies in the range of 50% - 96%. The maximum BOD removal efficiency was 96% at 2cm depth thickness of Rice husk. The various removal efficiencies of BOD were shown in the Fig 3.4

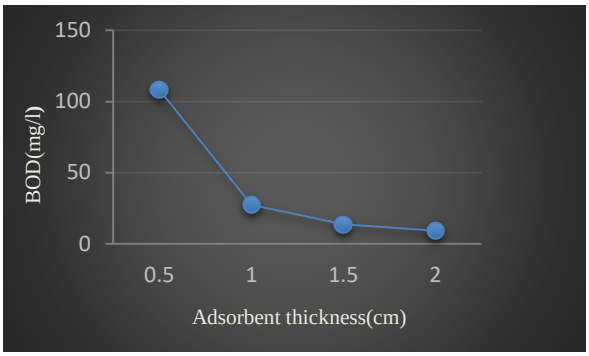

Fig 3.4BOD variation in the Effluent

3.5 Effect of Rice husk on COD of the sample

Initial COD of the dairy effluent sample wasobserved to be 452mg/l. The maximum removal of COD was 87% at 2cm adsorbent depth of Rice husk. The removal efficiencies was in the range of 40% to 87%. COD removal percentages were found to be drastically varying at different depths. The rate ofremoval in COD concentration is shown the Fig 3.5

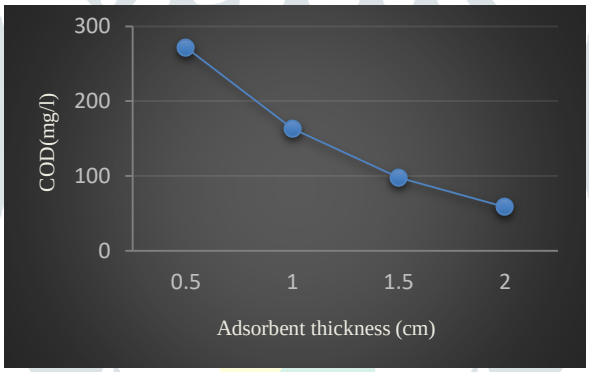

Fig 3.5COD variation in the Effluent

IV.Conclusion:

The study shows that rice husk can be effectivelyused as an adsorbent for treatment of dairy wastewater.

The following conclusions were drawn from the observations on the Dairy wastewater treatment by the usage of Rice husk as anadsorbent.

a) There is no significant change in pH while applying the coagulant in this wastewater.
b) The maximum Total Dissolved Solids removal efficiency was 75% on 0.5cm depth thickness of the coagulant.
c) The maximum Total Suspended Solids removal was 85% at 2cm depth thickness of the coagulant.
d) The maximum BOD removal efficiency was 96% at 2cm depth thickness of the coagulant.
e) The maximum COD removal efficiency was 87% at 2cm depth thickness of the coagulant.

V.Acknowledgment

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