

# TREATMENT OF DAIRY WASTE WATER USING LOW COST ADSORBENTS

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## ABSTRACT

The dairy industry involves processing of raw milk products to consumer milk, butter cheese etc. These processes utilize large quantity of water during their manufacture and later for cleaning purpose. The waste water generated from such operations has high B.O.D as the waste is mainly organic in nature. In this study low cost adsorbents were used in fixed bed and their effectiveness in B.O.D removal and other waste water parameters were studied.

**Keywords** – B.O.D, Dairy waste water, fixed bed reactor, Low cost adsorbents, Treatment.

## I. INTRODUCTION

Dairy plants consume large volumes of water for their manufacturing process. Large amount of water also used to clean the processing equipments which further add to the quantity of waste water generated. Dairy waste which is generated is organic in nature and can cause rapid oxygen depletion if the waste is directly released into the river stream without being treated by the process of self purification. Different types of biological processes are adopted for treatment of dairy waste such as Trickling filters, Activated sludge process, Oxidation ponds etc. This paper reported results of the effects of dairy waste strength on the performance of fixed bed reactors with the application of different adsorbents as packing media.

Tikariha[1] studied dairy waste water parameters which showed that water discharged from dairy processing units had high turbidity, TDS and low value of DO. Low value of DO indicated higher organic content and high BOD and COD. Sheetal Karle[2] used coconut shell activated carbon in treatment of dairy waste. Sunil Kulkarni[3] found that packed bed reactors were successfully used in treatment of may biological and physic-chemical waste water treatment.

## II. MATERIALS AND METHODS

Dairy waste water was treated by batch process by application of different contact medias. The reactor had a working volume of 15 m<sup>3</sup>. The support medias used for bacterial growth were Laterite stones, gravel, charcoal and ceramic. The waste water was kept in contact with the media for 1 day. The variation of waste water characteristics with each contact media was studied.

Table 1: Characteristics of dairy waste water obtained from the plant.

Parameters	Characteristics
Temperature °C	23-29
pH	4-13
Turbidity (NTU)	12-62
Alkalinity (mg/L)	10-565
B.O.D(mg/L)	60-129

## III. RESULTS AND DISCUSSION

The characteristics of the dairy waste water vary throughout the day. The CIP (Clean in place) technology adopted in dairy industry involves pumping of cleaning solutions such as Sodium hydroxide or phosphoric acid solution through the equipment results in further fluctuation in its waste characteristics. The present study was carried out using repeated batch technique to provide easy assessment. From Fig 1 it can be concluded that Gravel, Charcoal and Laterite media have effective pH neutralization capacity. The pH value of 5 was brought to 7-7.5 for all three medias. However waste water when in contact with ceramic media showed drastic increase in pH from 5 to 9.7.

Fig 2 shows that contact medias such as Gravel and Charcoal had 80 % BOD removal efficiency, Laterite showed 66.8 % removal whereas Ceramic showed

inconsistencies in BOD removal. The BOD removal efficiency were as follows Charcoal > Gravel > Laterite > Ceramic.

From Fig 3 it is observed that gravel and charcoal showed more than 75 % COD removal efficiency, where as Laterite had higher COD removal of 83.1 %. The COD removal efficiency were as follows Laterite > Charcoal > Gravel > Ceramic.

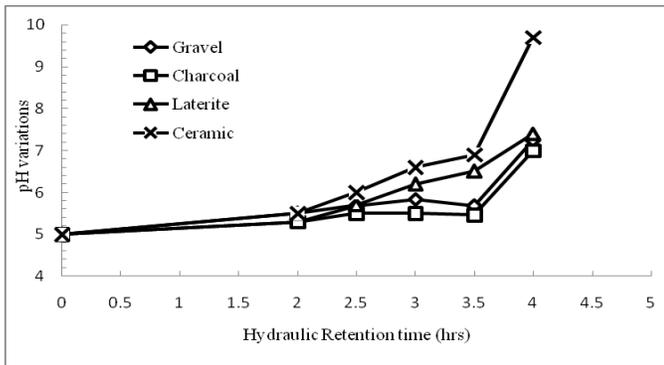


Fig 1: pH variations in the dairy waste water with different contact medias.

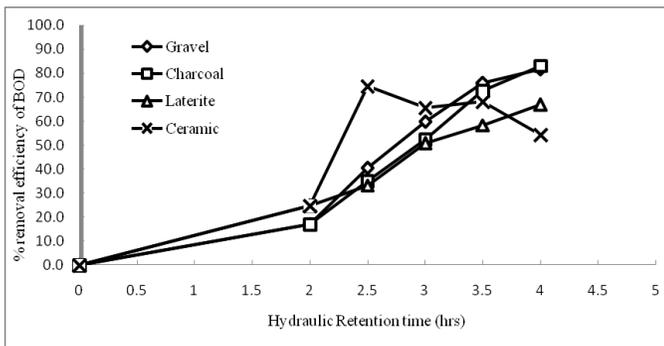


Fig 2: Influence of HRT on reduction of dairy waste water BOD using different contact medias.

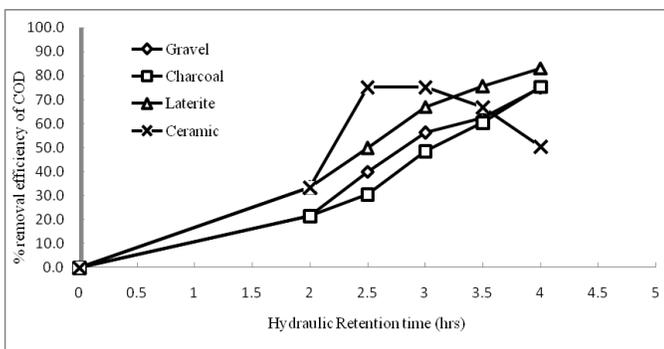


Fig 3: Influence of HRT on reduction of dairy waste water COD using different contact medias.

## IV. CONCLUSION

From the above results it can be proved that substantial amount of BOD and COD was reduced by gravel and charcoal media. Experiments showed 80% removal of BOD for charcoal and gravel media having a HRT of 6 hours. Similar observation was noted in case of COD. It is apparent from the above experiments that efficiency of removal for each waste water parameter is associated with the nature and properties of the contact media involved in the attachment of biomass. The pH value increased to 7 for gravel and Laterite and charcoal media thus proving it has that it has the capacity of neutralization. The use of packed bed contactor is a promising choice for treatment of organic waste. Laterite, gravel and charcoal can effectively used as low cost adsorbents in the treatment of dairy waste. The order of the effectiveness of all 4 contact medias for treating dairy waste water were as follows Charcoal > Gravel > Laterite > Ceramic.

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