

# PERFORMANCE STUDY ON ANAEROBIC FLUIDIZED BED REACTOR FOR TREATING SUGAR MILL WASTEWATER

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## ABSTRACT

Sugar industry is one of the major food industries in India. The sugar industry wastewater is a highly biodegradable waste. This study aims to develop the anaerobic digestion process for the biogas generation from the sugar industry wastewater in the fluidized bed reactor. The attempts were made to optimize the  $p^H$ , temperature, Hydraulic retention time, organic loading rate for the production of methane gas, the removal of COD and BOD of the sugar industry wastewater. In the experimental works consists of a laboratory model on the anaerobic fluidized bed reactor for a volume of 27.00m<sup>3</sup> liters.

**Key words:** Sugar industry, AFBR, wastewater.

## 1. INTRODUCTION

Sugar industry is mostly based on agriculture, which is playing a major role for strengthening the national economy and social development of a country. Sugarcane is the most widely produced agricultural commodity in the world. In recent year, the sugarcane industry rapidly developed. Now, we can adapting to a new concept and sustainable development. The sugarcane is the major raw material for this industry. The operating period of sugar mill is four to eight months for every year. The activities of sugar industry require the huge amount of fresh water for milling process.

Similarly, the sugar industry is also produced a large amount of wastewater. The wastewater from the sugar industries, if no properly treated it contains the significant quantity of total dissolved solids and total suspended solids. If they are normally discharged by water courses, it creates the odour problem, affect the aquatic life in water bodies and also not use for the irrigation purpose. The different type of process is used to treat the industrial wastewater.

Nowadays, the anaerobic process is much more suitable for the treatment for wastewater. In the treatment of wastewater is involved the various types of operations and process is carried out in the reactor. The anaerobic fluidized bed reactor with immobilized biomass has been widely used for the biological treatment of the wastewater. In the present study, the experimental work to performance study of anaerobic fluidized bed reactor for the wastewater treatment.

## 2. EXPERIMENTAL SETUP

In the laboratory model is anaerobic fluidized bed reactor for an effective volume of a reactor is 24lit with the functional components like peristaltic pump, influent vessel, effluent collection vessel, and measuring jar. The collection of gas is measured by water displacement method. In the model was empirically designed to test run at a specified range of influent flow is 2 to 12lit/hr, which will have the HRT lit 2.0 to 12hrs.

The schematic diagram for the experimental setup is given below:

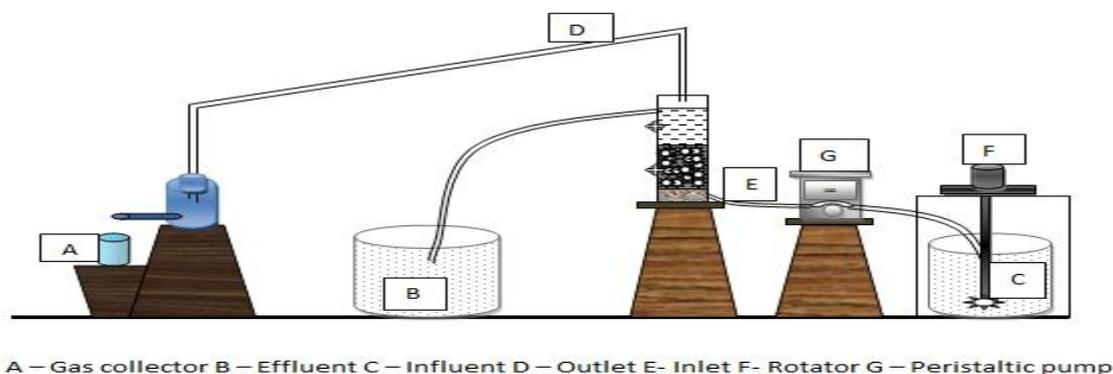


Fig-1 Schematic diagram for experimental setup

### 3. METHODOLOGY

The wastewater sample was collected in the clean polyethylene containers. In the experiment is started with the domestic wastewater for the stabilization process. The time period for the stabilization in the reactor is 45 days; with the COD removal varies for 78.70-79.50% for the average of influent COD is 740mg/lit.

In sugar industry, the wastewater is to be collected in two different times. By using the wastewater is used to be to run the reactor. According to two different parameters (i.e.,) influent COD (1100, 2000, 3000, 3500mg/lit) influent flow rate (2, 5, 8, 10,12lit/hr) the experiment is to be runned. In the operating condition, the characteristics of wastewater, the organic loading rate is interpreted and find to varying from 2.20 to 47.52 kg COD/m<sup>3</sup>day.

### 4. RESULT AND DISCUSSION

The experimental model on anaerobic fluidized bed reactor has been evaluated in terms of removal efficiency of COD and the generation of biogas. The result is to be carried out by influent and effluent COD, the percentage of COD removal and generation of biogas.

The performances of the model with respect to %COD removal, the experimental results were interpreted for OLR and HRT. The gas conversions were interpreted to %COD removal with respect to OLR and HRT.

The experimental results is represented by graphical methods. The fig-2 represents the OLR v<sub>s</sub> %COD removal. The fig-3 represent the HRT v<sub>s</sub> % COD removal. The fig-4 represents the HRT v<sub>s</sub> gas conversion. The fig-5 represents the OLR v<sub>s</sub> gas conversion.

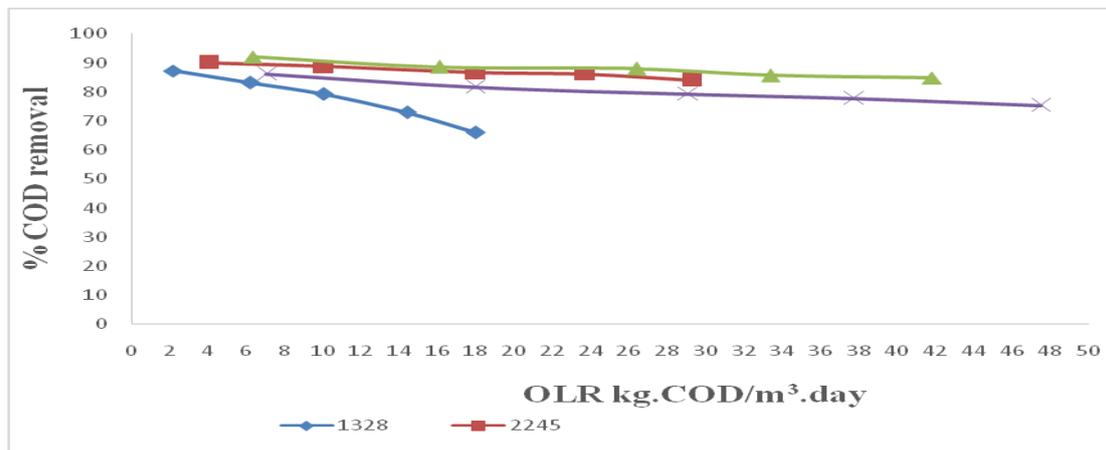


Fig-2 OLR V<sub>s</sub> %COD removal

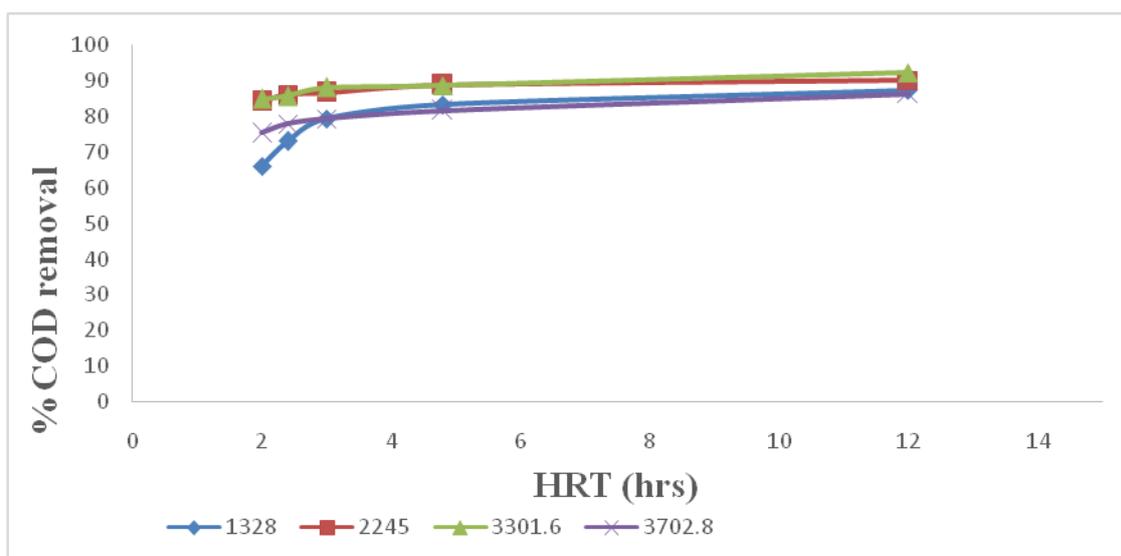


Fig-3 HRT V<sub>s</sub> %COD removal

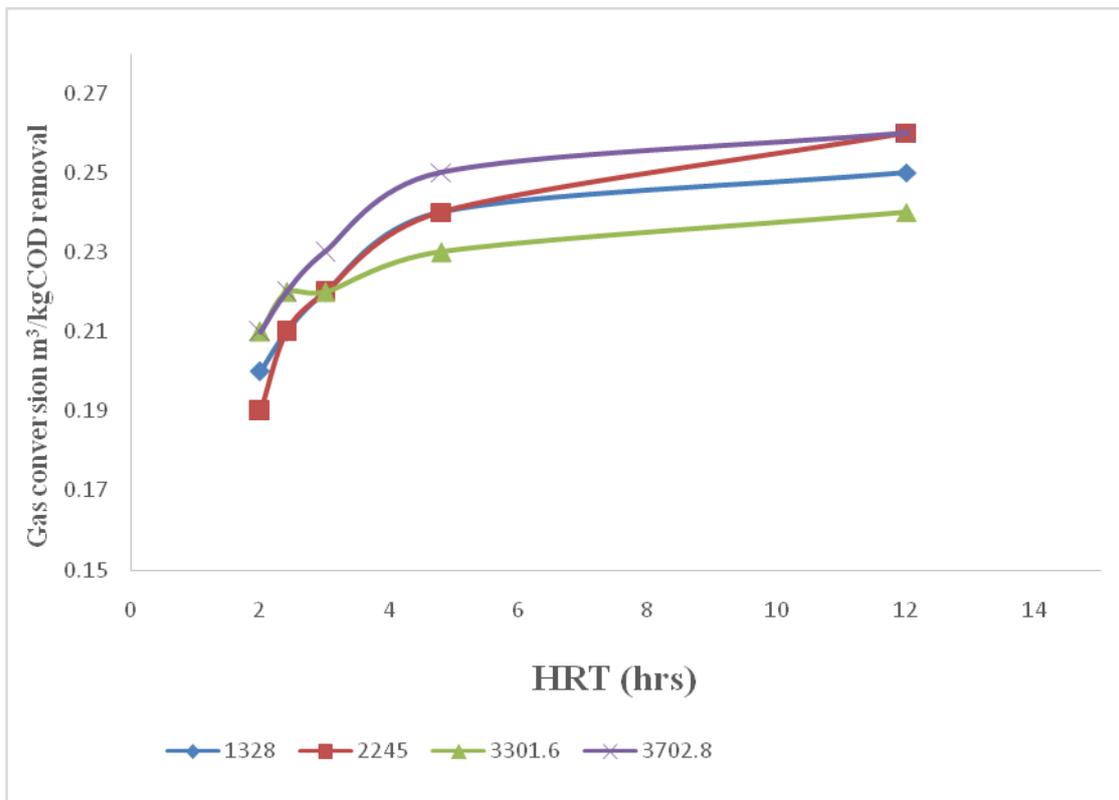


Fig-4 HRT vs Gas conversion

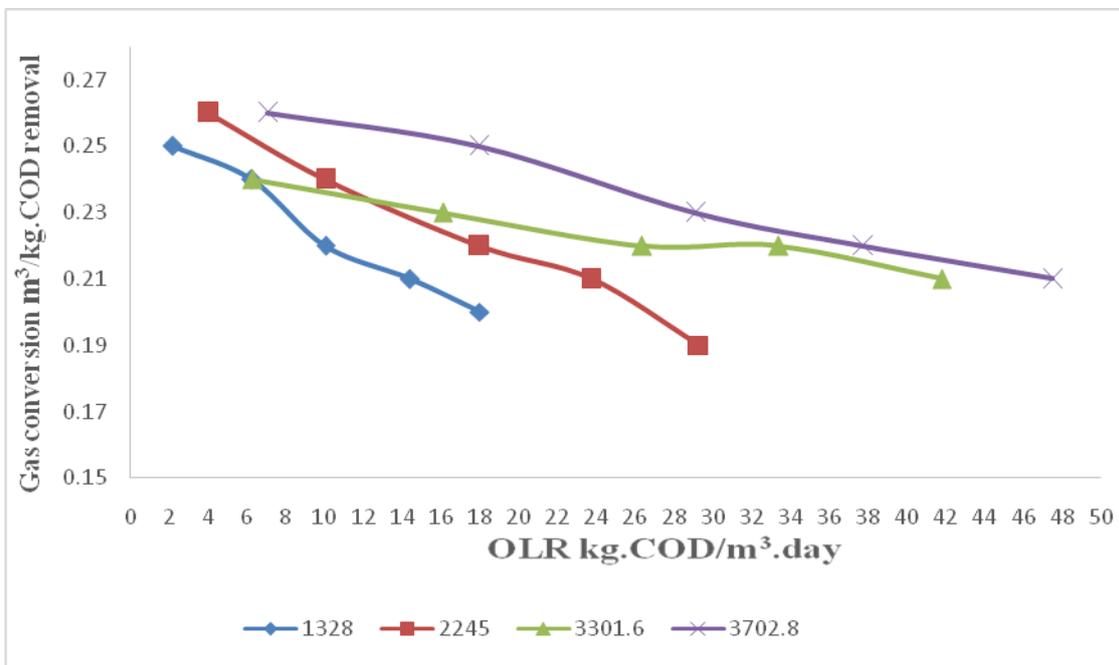


Fig-5 OLR vs Gas conversion

The maximum % COD removal efficiency was observed at 92.10 for an operating OLR is 6.33 kg COD/m<sup>3</sup>day and HRT is 12 hrs. The minimum % COD removal efficiency was observed at 66.00 for an operating OLR is 18.00 kg COD/m<sup>3</sup>day and HRT is 2.0 hrs.

The generation of biogas at maximum value was observed at 0.26 m<sup>3</sup>/kg COD removal for an HRT is 12.0 hrs. The generation of biogas at minimum value was observed at 0.19 m<sup>3</sup>/kg COD removal for an HRT is 2.0 hrs.

### 5. CONCLUSION

The maximum COD removal efficiency was observed at 92.10% under the OLR is 6.33kg COD/m<sup>3</sup>day and HRT is 12hrs. The maximum biogas was collected at 0.26m<sup>3</sup>/kg COD removal for an HRT is 12.0 hrs. The anaerobic fluidized bed reactor for the treatment of sugar industry wastewater is suitable for the reactor model.

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