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Anaerobic Treatment of Food Processing Waste

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Abstract – *Industrial activities requires huge amount of water, as they generates high quantity of residue which results impact on environment. In order to reduce the impact food processing waste it is necessary to treat food processing wastewater. Anaerobic treatment of food processing wastewater to be done. Anaerobic Digestion is the degradation of organic matter by a microbial population that lives in oxygen free environment. This work focuses on reduction of COD by anaerobic digestion of food processing waste water,*

The performance of reactor in removing COD with respect to different organic loading rates.

Key Words: **Food Processing Waste Water**, **Anaerobic Digestion, Organic Matter, COD**, **Organic Loading rates**

1. INTRODUCTION

For decades, the receiving environment (rivers, lakes and sea) has receipt urban and industrial wastewater without any treatment. The majority of this wastewater does not undergo any previous treatment before its reject in the receiving environment, which leads to the deterioration of the receiving medium and constitute a considerable factor of pollution. This latter could be of chemical, organic or physical. In several cases industries are not equipped with sewage treatment plant. The majority of industrial effluents are directly discharged in the nature, without any limit of norms. Our study aims to analyze the feasibility of a biological treatment of a food processing waste. First, we conducted physical and chemical characterization of all pollution parameters such as COD, BOD5, NO3 - and SO4 2- ions. Then, we applied a biological treatment to these effluents through an anaerobic means. This study aims to present an adequate system to reduce this pollution.

1.1 Anaerobic Digestion

Anaerobic digestion is a biological process which utilises bacteria that operate without the need for a constant supply of oxygen. These bacteria convert COD to methane and carbon dioxide thus reducing the trade effluent charge for the effluent treatment. The Biochemical Oxygen Demand (BOD) of the trade effluent, although using aerobic organisms in the test assay, can be an indication of the degree of COD reduction which can be achieved by the anaerobic digestion process. However as the process differs fundamentally from the aerobic process specific anaerobic biodegradability testing on the trade effluent should be performed to give a truer indication of the degree of anaerobic treatment.

2. MATERIALS AND METHDOLOGY

The food processing waste water collected from maize industry. Grab sampling of the sample was done and preservative are added to the sample and brought to the environmental laboratory of civil engineering department, PDA College of engineering, kalaburagi. The physico-chemical characteristics were tested as per methods prescribed by CPCB for examination of water and wastewater [21st edition, 2012].

A.FABRICATION AND EXPERIMENTAL SETUP

Aspirator Bottle no.1 of 10.0L capacity is used as digester with working volume of 8L for the reactor. The digester is connected with the second aspirator bottle of 5.0L capacity, which will contain the NaOH solutions. The produced gas is collected in another container by water displacement method. The NaOH solution is displaced from second aspirator bottle and collected in the measuring cylinder and the amount of gas produced will be measured.

B.STARTUP OF REACTOR

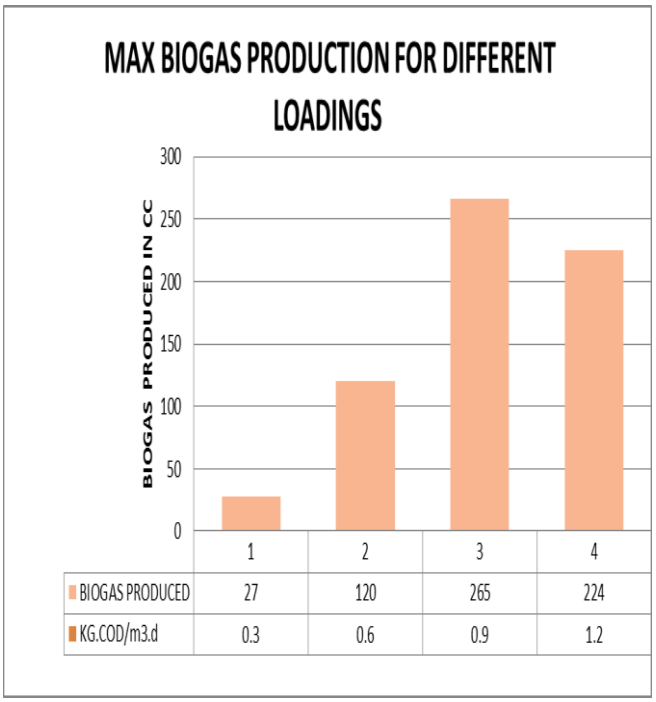
For the initial startup, cow dung slurry and septic tank waste is used as seed sludge and placed in the digester for acclimatization.

Reactor is fed with 2L filtered cow dung slurry (made by adding 40g of cow dung in 2L of tap water) and mixed with septic tank wastewater about 100mL/L and made up to 8L total working volume. The digester is allowed for stabilization, after adding seed sludge for about 20 days. Once the reactor gets stabilized, initially it was loaded with 0.3 Kg.COD/m^3.d. And after stabilization subsequently the reactor loading were increased with 0.6,0.9,1.2Kg.COD/m^3.d organic loadings.

3. RESULTS AND DISCUSSION

The laboratory bench scale Anaerobic reactor is set up for treating food processing waste water of 10.0 liters capacity working volume The characteristics of the samples such as pH, BOD_5, COD, Alkalinity, Total Solids, Suspended Solids, Dissolved Solids, Total Volatile Solids, Sulphate Nitrates, Chlorides and Volatile Fatty Acids. The influent and effluent

characteristics of food processing waste wastewater at various Organic Loading Rate (OLR) 0.3, 0.6, 0.9 and kgCOD/m^3.d**)** analysed respectively and gas production at different OLR also noted. The study was conducted at ambient temperature varying from 30-40 ^{0}C.



3.1 Variation of Gas Production per day with respect to Organic Loading Rate

As the Loading rate increases amount of Gas production also increase and reaches maximum value at 0.9 KG.COD/m^3.d then decreases for subsequent loadings. Maximum Biogas production is at an OLR of 0.9 Kg.COD/m^3.d i.e., 265mL/d and Minimum Biogas production is at an OLR of 0.3Kg COD/m3.d i.e., 27mL/d as shown in above Fig 3.1.

4. CONCLUSIONS

- The waste is biodegradable in nature as the value of BOD/COD ratio is 0.60.
- Alkaline condition favours methonogenisis process hence it is maintained for all the loadings to improve the performance.
- For OLR of 0.9 Kg.COD/m^3.d the maximum Biogas produced is 265cc hence for the Bench scale model this is selected as Optimum Organic Loading Rate.
- Gas production increases as a loading increases up to OLR 0.9 Kg.COD/m^3.d and then decreases with subsequent loading.
- The max removal efficiency of Sulphate, Nitrate and COD obtained are **.45%, 45.31 %, and 32% ,** for OLR of 0.9 Kg.COD/m^3.d.
- The max removal efficiency of TS and DS obtained are **39.9% and 58.11%** for OLR of 1.2Kg.COD/m^3.d.
- VFAs increases with increase in OLR.

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BIOGRAPHIES

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