UTILIZATION OF SUGAR MILL WASTE WATER FOR BIOGAS GENERATION USING HYBRID ANAEROBIC REACTOR

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Introduction

With the growing population and increasing levels of urbanization and industrialization, the water is becoming a source resource and also getting polluted at a very rapid rate. To overcome these, the wastewaters from the industries shall be treated properly and maximum reuse/ recycling shall be practiced. These wastewaters can be either treated with aerobic process or anaerobic systems. Compared to the aerobic systems, anaerobic systems have become popular due to less energy consumption and ease of maintenance etc. Upflow Anaerobic Sludge Blanket (UASB) reactor is one such anaerobic system that treats effluents having high organic content. Hybrid UASB (HUASB) is an improvisation over the conventional UASB that can be used for a wide variety of effluents.

Objectives

Generation of Biogas from Sugar Mill Wastewater using HUASB.

Experimental Setup

A model HUASB made of 5mm acrylic sheet, having a dia of 100mm and height of 1.3m used. It was provided with necessary pumps, inlet/ outlet arrangements etc. for the feed, gas and sludge removal. Polypropylene rings were filled in the packing zone. All openings were sealed air tight to maintain anaerobic conditions. After completing leakage test and rectification of leaks, the reactor was filled with 1.7 ltr of active septic tank sludge. The sugar mill wastewater (of known COD) diluted to 1 ltr was fed from the bottom of the reactor. The studies were done at room temperature and pH was maintained at 6.5-7.3. COD:N:P ratio was maintained at 350:5:1. The reactor was operated for different Hydraulic Retention Times (HRT) and Organic Loading Rate (OLR) with COD ranging from 2000-4000 ppm. HRT was maintained at 48 hours for 35 days, 24 hours for 4 days and 12 hours for remaining period. Samples were drawn daily and tested for pH, COD, biogas production, its methane content, volatile fatty acids, alkalinity, total Kjeldahl Nitrogen etc. and the results were tabulated.

Results and Conclusions

The granulation of seed and substrate achieved in 60 days. Maximum COD removal efficiency was 85% for an OLR of 8 kg COD/m^3d and HRT of 24 Hours. Biogas of 7.25 Ltr/d was produced with 60-70% methane content, which can be captured as byproduct for energy generation. PP rings proved as effective packing media.