Study of the Anaerobic Degradation Potential of High Strength Molasses Wastewater

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Abstract : The treatment of high strength wastewater by an Upflow Anaerobic Sludge Blanket (UASB) reactor has several benefits, such as high organic removal efficiency, short hydraulic retention time along with low operating costs. In addition, high volumes of biogas are released in these reactors, which can be utilized in several industrial facilities for energy production. This study aims at the examination of the application potential of anaerobic treatment of wastewater, with high molasses content derived from yeast manufacturing, by a lab-scale UASB reactor. The molasses wastewater and the sludge used in the experiments were collected from the wastewater treatment plant of a baker's yeast manufacturing company. The experimental set-up consisted of a 15 L thermostated UASB reactor at 37 ◦C. Before the reactor start-up, the reactor was filled with sludge and molasses wastewater at a ratio 1:1 v/v. Influent was fed to the reactor at a flowrate of 12 L/d, corresponding to a hydraulic residence time of about 30 h. Effluents were collected from the system outlet and were analyzed for the determination of the following parameters: COD, pH, total solids, volatile solids, ammonium, phosphates and total nitrogen according to the standard methods of analysis. In addition, volatile fatty acid (VFA) composition of the effluent was determined by a gas chromatograph equipped with a flame ionization detector (FID), as an indicator to evaluate the process efficiency. The volume of biogas generated in the reactor was daily measured by the water displacement method, while gas composition was analyzed by a gas chromatograph equipped with a thermal conductivity detector (TCD). The effluent quality was greatly enhanced due to the use of the UASB reactor and high rate of biogas production was observed. The anaerobic treatment of the molasses wastewater by the UASB reactor improved the biodegradation potential of the influent, resulting at high methane yields and an effluent with better quality than the raw wastewater.

Keywords : anaerobic digestion, biogas production, molasses wastewater, UASB reactor
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