

Thesis Title	Effect of mode of feed on the Performance of Anaerobic filter Reactor
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Abstract

Anaerobic filter Reactor is a type of high rate Anaerobic biogas Reactor. Important parameters, which influence Anaerobic filter Reactor performance considerably, are the types and characteristics of supporting media and the mode of feed. The previous research reported that high concentration of substrate and microorganism at the entrance of reactor caused large difference of reactor performance between the entrance zone and other part of the reactor. For long term operation, microorganism and solid accumulation may cause plugging and channeling of flow might be occurred. Though effluent recirculation of process increased distribution of the suspended solid and the substrate throughout reactor height but this will also increased the operation cost too.

The aim of this thesis was to evaluate the effect of three different feeding modes of upflow, downflow and up side flow on the process performance of the anaerobic filter reactors. The reactor volume used in the study was 61.2 litres and the liquid volume was 52 litres. PVC ring size 1.8 x 1.8 cm. was used as supported media. The surface area per unit volume of the packing media was 246 and the void fraction was 0.854. The up side flow operation was expected to enhance substrate and microorganism distribution throughout the reactor height and increased the system performance such as biogas productivity, COD removal efficiency and system stability.

Experiments showed that for the upflow and down flow reactors did COD concentrations at differing reactor level differ considerably for HRT below 3 days whereas up side flow reactor showed no significant difference in COD concentration at differing reactor level.

Most of the biomass of the up side flow reactor and the upflow reactor were in suspension but most of biomass of the downflow reactor were attached on the supporting media. The downflow reactor could accumulate biomass more than the up side flow and the upflow reactors. The gas yields of the down flow reactor was $0.86 \text{ m}^3/\text{m}^3\text{reactor}$ which was higher more than the up side flow ($0.82 \text{ m}^3/\text{m}^3\text{reactor}$) and upflow (reactor $0.79 \text{ m}^3/\text{m}^3\text{reactor}$). The activities of biomass of all

reactors were between 0.05-0.062 $\text{m}^3/\text{kg.VSS/day}$. The biomass on supporting media of up side flow at differing reactor level showed no appreciable gradient whereas for the downflow reactor there was biomass gradient from the top to the bottom of the reactor. The COD removal efficiency of the up side flow was lower than the downflow reactor and upflow reactor. Possibly due to the mixing effect in the up side flow reactor which, according to RTD study, was nearly completely mixed flow.

The hydraulic characteristics in the reactors were studied in terms of Dispersion number, it was found that the up side flow and the downflow reactors operated a HRT 1.5 and 1 day behaved nearly as a plug flow reactors the Dispersion number were 0.094 and 0.084 for the downflow reactor and 0.087 and 0.084 for the upflow reactor for the 1.5 and 1 HRT, respectively. Hydraulic characteristics of the up side flow reactor were closed to a perfectly mixed reactor at all HRT.

Keywords : Biogas production/Anaerobic filter/Mode of feed/
Hydraulic characteristic/substrate distribution