

Influence of upflow velocity on performance and biofilm characteristics of Anaerobic Fluidized Bed Reactor (AFBR) in treating high-strength wastewater

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Abstract

One of the key parameters in Fluidized Bed reactors is the control of biofilm thickness and configuration. The effect of upflow velocity on performance and biofilm characteristics of an Anaerobic Fluidized Bed Reactor was studied in treating Currant wastewater at various loading rates. The reactor used this study was made of a plexiglass column being 60 mm diameter, 140 cm height, and a volume of 3.95 L. The results demonstrated that the AFBR system is capable of handling an exceptionally high organic loading rate. At organic loading rates of 9.4 to 24.2 (kg COD m⁻³) at steady state, reactor performances with upflow velocities of 0.5, 0.75 and 1 (m min⁻¹) were 89.3- 63.4, 96.9 – 79.6 and 95 – 73.4 percent, respectively. The average biomass concentration per unit volume of the AFBR (as gVSSatt L⁻¹ expended bed) decreased with the increase of upflow velocity in the range of 0.5–1 m min⁻¹ at all applied organic loading rates. The total biomass in the reactor increased with increases in the organic loading rate. The peak biomass concentration per unit volume (as gVSSatt L⁻¹ expended bed) was observed at the bottom part of the reactor, then it dropped off slowly towards the top. The biofilm thickness increased from the bottom to the top of the reactor representing a stratification of the media in the AFBR. The bed porosity increased from the bottom to the top of the reactor.

Keywords

Biofilm characteristics, Biomass concentration, Anaerobic Fluidized bed Reactor, Currant wastewater, Upflow velocity