

Hydrodynamic characteristics and flow regime investigation of an anaerobic baffled reactor (ABR)

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ABSTRACT

This research investigates the hydrodynamic characteristics of a 6-liter and 8-compartment anaerobic baffled reactor (ABR) including dead volumes, short-circuiting, and reactor's flow regime. Maximum dead volume was approximately 11% of total volume while the short-circuiting was not considerable. The minimum number of reactor's equivalent tanks in series (TIS) was estimated to be 10. The lowest hydraulic efficiency was 80%. The reactor's performance was similar to that of the ideal plug flow reactors, due to its large number of compartments. In addition, the minimum plug flow volume was about 78% of total reactor volume. For better assessment of the flow regime, the "plug flow index" (PI) was proposed and the reactors were classified based on this index. Since PI was more than 0.75, the reactor was classified in the category of "Plug Flow Reactors". Variations in a number of environmental parameters such as temperature, dissolved solids, and suspended solids were considered. The results showed that a decrease in temperature and addition of high amounts of dissolved solids make the reactor an ideal plug flow reactor while suspended solids do not change the flow regime.

Keywords: Anaerobic baffled reactor; Dead volume; Hydrodynamics; Plug flow index

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