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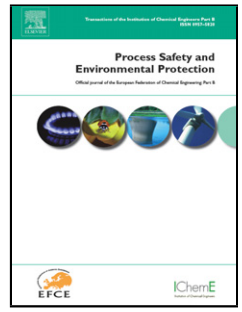

Title: Influence of internal fluid velocities and media fill ratio on submerged aerated filter hydrodynamics and process performance for municipal wastewater treatment

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Influence of internal fluid velocities and media fill ratio on submerged aerated filter hydrodynamics and process performance for municipal wastewater treatment

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Highlights

- Currently SAF design follows a black box approach with no regard for hydrodynamics
- Bioreactor hydrodynamics influences fluid retention, mixing and mass transport
- Tracer tests were completed on a 7.7 m^3 SAF with a range media fill ratios
- Results suggested that SAF hydrodynamics directly influenced process performance
- A 50% media fill ratio showed optimum hydrodynamic conditions for BOD_5 removal
- A 100% media fill ratio showed optimum hydrodynamic conditions for NH_4^+ removal

Abstract

Submerged aerated filters (SAFs) treat wastewater to achieve stringent organic carbon and ammonium (NH_4^+) effluent consents. Currently SAF design follows a black box approach, where inlet and outlet contaminant concentrations are monitored, with little consideration for internal hydrodynamic conditions. Although tracer tests have been used on bioreactors, integrated monitoring of internal fluid velocities, mixing characteristics and process performance has not been established for SAFs. Tracer tests were performed on a 7.74 m^3 SAF, with internal recirculation at 100, 75, 50, 25 and 0% media fill ratios with and without biofilm on the media surface. Results suggested that, SAF internal hydrodynamic conditions directly influenced process performance and media fill ratios could be manipulated to provide optimum conditions for removal of biochemical oxygen demand (BOD_5) and NH_4^+. A 50% media fill ratio showed optimum hydrodynamic conditions for BOD_5 removal, with a removal efficiency of 70% (mass removal of 1.59 $kg.m^{-3}.d^{-1}$). A 100% media fill ratio showed optimum hydrodynamic conditions for NH_4^+ removal, with a removal efficiency of