

Effects of the hydraulic retention time on the fouling characteristics of an anaerobic membrane bioreactor for treating acidified wastewater

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Received 31 May 2009; Accepted 17 December 2009

ABSTRACT

This study focused on the effect of hydraulic retention time (HRT) effect on microbial activity and fouling potential in submerged anaerobic membrane bioreactors (AMBRs). Three submerged AMBRs were operated at HRT of 14, 16, and 20 days with polypropylene U-shaped hollow fiber microfiltration membranes (nominal pore size = 0.45 μm ; effective filtration area = 0.003 m^2). Extracellular polymeric substances (EPS) and soluble microbial production (SMP) production increased as HRT was decreased from 20 to 14 days: from 24.2 to 29.4 mg/g volatile suspended solids (VSS), from 105.2 to 357.1 mg dissolved organic carbon (DOC)/L, respectively. Although high production of EPS and SMP at short HRT caused high cake resistance, it improved soluble COD removal efficiency by preventing small particles or macromolecules from passing through the membrane. Microbial floc in sludge showed similar resistance values regardless of HRT, while colloids and solutes had higher fouling potential than microbial floc, and this trend was severer at short SRT. In conclusion, in the operation of submerged AMBRs, HRT can significantly affect the cake formation on the membrane surface, which causes severe fouling. However, this cake layer plays a major role in additional organic removal, as it acts as a dynamic membrane.

Keywords: Anaerobic membrane bioreactor (AMBR); Hydraulic retention time (HRT); Membrane fouling; Sludge characteristics; Dynamic membrane

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