Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2021.27684

236 (2021) 26–44
October

Fouling mechanism in dynamic membrane anaerobic bioreactor treating domestic sewage: filtration performance

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Received 4 May 2021; Accepted 4 August 2021

ABSTRACT

In order to investigate the fouling mechanism in dynamic membrane (DM) formation, and filtration performance in domestic sewage treatment at an ambient temperature ranging from 24°C to 36°C, an anaerobic dynamic membrane bioreactor (AnDMBR) was monitored. Hydraulic retention times applied were 8 and 12 h, under permeate fluxes of 1,755 and 1,170 L m^{-2} h^{-2} in phases I and II, respectively. In both phases, after a 10% reduction in permeate flux, backwashing was performed. This allowed a prolonged filtration of 84 d for phase I and 76 d for phase II. The total resistance to filtration was in the magnitude of 10^{11} m^{-1}, implying excellent filterability by the DM, and energy-saving potential for the AnDMBR system. The system had good treatment performance, achieving average volatile fatty acid reduction of 53%, total chemical oxygen demand (COD) removal efficiencies of 84%, soluble COD of 72%, and color of 80%; being able to remove 94% of suspended solids, and producing an effluent with low turbidity (17 NTU). The biogas measured in the system was 154 N mL g^{-1} COD removed, which represents 35% of its theoretical value, which means that most of it left in dissolved form with the effluent due to supersaturation. The predominant fouling mechanism in DM formation in all permeates fluxes tested was cake filtration, with the main cause being the concentration of inoculum sludge. This confirms the prominence of DM formation during filtration and high solid–liquid separation.

Keywords: Real domestic wastewater; Fouling mechanism; Permeate flux; Total resistance; Filtration performance

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