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Anaerobic membrane bioreactors—a mini review with emphasis on industrial wastewater treatment: applications, limitations and perspectives

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ABSTRACT

Anaerobic membrane bioreactors (AnMBRs) are increasingly being used in industrial wastewater treatment as the technology represents a cost-effective alternative to that based on aerobic processes. Not only AnMBRs are highly efficient in reducing chemical oxygen demand but the organic matter removed is transformed into a useful energy source—biogas. AnMBRs produce effluent that is free of solids and pathogens and rich in nutrients, while occupying a small footprint. As the membrane retains biomass, AnMBRs enhance performance when dealing with inhibitory or toxic substrates, typical of industrial wastewaters. Some drawbacks remain, however, including membrane fouling and its associated effects as well as poor efficiency at lower temperature (AnMBRs are usually operated at mesophilic or thermophilic conditions). Further research is needed on lowering hydraulic retention time, removal of nutrients, removal of specific micro-pollutants, establishing quantitative mass and energy/economic balances and inclusion of efficient dissolved methane recovery. In this mini review, the applications, limitations and perspectives of AnMBRs are summarized and evaluated with an emphasis on industrial wastewater treatment. Moreover, the AnMBR is compared with other wastewater treatment technologies presently available.

Keywords: Anaerobic membrane bioreactor; Industrial wastewater; Membrane fouling; Methane recovery

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