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Development of a cost model for membrane bioreactors including sludge handling costs

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ABSTRACT

Membrane bioreactors (MBRs) are state of the art in municipal wastewater treatment. One of their main disadvantages is the high energy demand for air scour of the membrane. However, due to more stringent legal restrictions, sludge handling costs will increase and therefore they are becoming more and more signifi cant for the total operating cost of the MBR. In this study, a novel cost model approach for immersed MBRs treating municipal wastewater incorporating the energy demand for aeration and fouling prevention as well as the related sludge handling costs subject to local conditions is presented. The model is consciously kept simple to be easily applicable for end users and is based on a few easily accessible input parameters like operational (hydraulic retention time, sludge retention time) and bio-kinetic parameters (yield, decay coefficient) and feed conditions. Information on bio-kinetic parameters and oxygen transfer efficiency varies strongly in the literature; therefore, the correct choice of these parameters is essential for an applicable model to avoid the over- or under-estimation of the impact of aeration on the system. In first simulation and sensitivity studies, the derived framework was found to be appropriate to predict the total costs of an immersed MBR.

Keywords: Membrane bioreactor modelling; Dewatering; Aeration; Costs

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