Study of the influence of different variables on membrane fouling in submerged membrane bioreactors

A. Urkiaga*, D. Iturbe, J. Etxebarria, E. Agirre

Gaiker Technology Centre, Parque Tecnológico, Edificio 202, 48100 Zamudio, Spain, Tel. +34 94 6002323; emails: urkiaga@gaiker.es (A. Urkiaga), iturbed@gaiker.es (D. Iturbe), etxebarria@gaiker.es (J. Etxebarria), agirree@gaiker.es (E. Agirre)

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ABSTRACT

Membrane fouling is still the greatest handicap to overcome in membrane bioreactor (MBR) technology. In this study, a multi-factorial experimental design was carried out in order to optimize the MBR process, studying the effect of major variables involved in the fouling phenomenon as well as the interaction between them. To that end, a submerged membrane bioreactor was operated at three different levels of: sludge retention time (SRT) [25 and 60 d], mixed liquor suspended solids (MLSS) [6 and 14 g/L], and ratio between soluble and particulate chemical oxygen demand (sCOD/pCOD) [1 and 4] in the wastewater. The concentration of extracellular polymeric substances (EPS), as one of the most relevant factor responsible for membrane fouling, and the permeate flux were measured. After an exhaustive statistical analysis, it was confirmed that there is a relationship between the concentration of EPS and membrane fouling. It also appears that the ratio sCOD/pCOD in the composition of the wastewater plays a very important role in the fouling which becomes less pronounced as the soluble fraction increases. Moreover, high fouling potential was observed at high SRT values. Finally, it was proved that the membrane fouling was slightly less pronounced at higher MLSS concentration.

Keywords: Activated sludge; Extracellular polymeric substances (EPS); Fouling; Membrane; Microfiltration; Mixed liquor suspended solids (MLSS); Particulate matter; Soluble matter; Sludge retention time (SRT); Submerged membrane bioreactor (SMBR)

*Corresponding author.

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