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The status of industrial and municipal effluent treatment with membrane bioreactor technology

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## Abstract

The status of MBR technology has been scrutinised with reference to (a) available commercial technologies and their characteristics, (b) key design and performance parameters of existing full-scale installations, and (c) practitioner perception. The key design and operating parameters of flux and COD removal were considered with reference to 100 installations, 40 based on municipal and 60 on industrial wastewater treatment. The perception of practitioners was appraised through a conventional survey, with 186 respondents.

A review of the commercial products revealed polyvinylidene difluoride (PVDF) to be the most prevalent membrane material, accounting for almost half of all products, and provided both in flat sheet (FS) and hollow fibre (HF) configurations. Polyethylsulphone (PES) and polyolefinic membranes (polyethylene, PE and polypropylene, PP) were also found to be available in FS and HF configurations respectively. Almost all products had a nominal membrane pore size between 0.03 and 0.4  $\mu\text{m}$ .

Design fluxes in  $\text{L m}^{-2} \text{h}^{-1}$  (LMH) for municipal wastewater treatment were predominantly in the 15-25 LMH range,  $18.5 \pm 4.8$  LMH on average, for the average daily flow (ADF), and in the 20-30 LMH range,  $26.0 \pm 6.6$  LMH on average, for peak daily flow (PDF). Fluxes were lower, and dependent on both process configuration and effluent quality, for industrial effluents; the most challenging effluents (landfill leachate) were associated with the lowest fluxes. As expected, treatment capability related roughly to the feedwater BOD/COD ratio, with more than 90% COD removal achieved for food and beverage effluents (for which BOD/COD ratios were largely above 0.5) – comparable with municipal wastewater treatment.

Respondents to the survey, around 85% of whom were practitioners, identified pre-treatment (screening) as presenting the greatest technical challenge to MBR operation.

*Keywords* - Membrane bioreactor; flux; COD removal; municipal wastewater; industrial effluent; practitioners

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