Desalination and Water Treatment
www.deswater.com
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doi: 10/5004/dwt.2012.2464

Taylor & Francis
Taylor & Francis Group

42 (2012) 94–99
April

Wastewater polycyclic aromatic hydrocarbons removal by membrane bioreactor

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Received 20 October 2010; Accepted 15 February 2011

ABSTRACT

The capacity of removal polycyclic aromatic hydrocarbons (PAHs) by membrane bioreactor (MBR) has been studied. The study has been developed at pilot scale using a pre-denitrifying MBR and several stages have been checked at bench-scale. Concentration of PAHs was determined by gas chromatography (GC) and mass spectrometry (MS) with twister and a balance on the MBR system was achieved. The system was feeded with raw wastewater which contains usually pyrene, phenanthrene and fluoranthene at low concentration (<0.3 ppb). Treated wastewater concentration was under detection limits for all detected PAHs and sludge accumulation was not observed. Under operational MBR conditions, several removal mechanisms and different removal rates for each compound are presented along the treatment process. Bench-scale experiments reveal that PAHs removal is mainly due to sorption and air stripping, however the volatilization and biodegradation present a questionable insignificant contribution. Toxicity by PAHs during MBR treatment can not be expected due to the low bio-available for the microorganisms mainly as a result of the high removal by air stripping.

Keywords: Polycyclic aromatic hydrocarbon; Wastewater; Phenanthrene; Flouranthene; MBR; Pyrene

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