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Treatment of primary settled municipal wastewater in a pilot scale MBR

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ABSTRACT

Membrane bioreactors (MBRs) technology shows many advantages that convert it into an attractive solution for upgrading existent wastewater treatment plants (WWTP). The aim of this study was to investigate the feasibility of applying an MBR for treating primary settled wastewater in large WWTPs. In the 400,000 inhabitants equivalent WWTP of Vigo (NW Spain), 174,000 m^3 d^{-1} of wastewater receives primary treatment, whereas only 130,000 m^3 d^{-1} receives secondary treatment. In this facility, land scarcity is an issue, thus, the conventional activated sludge system (CAS) used may be replaced by MBR to retrofit this WWTP. This study was carried out in an MBR pilot plant of 3.97 m^3 effective volume using a modified University of Cape Town (UCT) process with a Zenon ZW500d membrane module operating at low HRT (4–7 h). During the experimental stage, permeability values ranged from 90 to 125 l h^{-1} m^{-2} bar^{-1}, with fluxes between 20–23 l m^{-2} h^{-1}. Only three maintenance cleanings were applied during the 286 experimental days. Total COD values of the used wastewater were 50–350 mg l^{-1}. Good performance in COD and BOD_5 removal was achieved, being 15 ± 7 mg l^{-1} and 5 ± 3 mg l^{-1}, respectively. Nitrogen removal efficiency was limited (40–60%), due to the low COD/N ratio in the influent. Primary settling protects MBR against membrane clogging and gives robustness to this technology.

Keywords: Low-strength wastewater; Membrane bioreactor; Primary wastewater; Water reuse; Hollow fibre; WWTP upgrading

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