

INFLUENCE OF AERATION ON FOULING WITH SUPERNATANT FILTRATION IN MEMBRANE BIOREACTORS

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Membrane bioreactors (MBRs) are a key process for wastewater treatment in term of low installation footprint and high water quality. The major drawback in MBRs is fouling. In order to reduce and limit this fouling, aeration is used in MBR systems. This presentation will focus on the influence of aeration during a filtration at constant volume of activated sludge supernatant in a side-stream MBR. Aeration impact will be studied in terms of fouling coupled with supernatant biological properties. Filtration is performed on a semi-industrial scale MBR (3.02 m² membrane surface) with outside/in hollow fibre membranes. In this side-stream MBR, hollow fibres are put in an external cartridge where both supernatant at low velocity and air are circulating around and inside the fibre bundle. Three short-term experiments with different membrane specific aeration demands (SAD_m of 0, 0.10 and 0.19 Nm³.h⁻¹.m⁻²_{membrane}) were performed using flux-step method to characterise fouling. Feed, concentrate, permeate and backwash samples were taken during filtration. They were analysed with size exclusion high performance liquid chromatography (HPLC-SEC) coupled with fluorescence detection, in order to determine concentrations of protein-like and humic-like substances. Results show that whatever the aeration rate, two kinds of populations were found, macromolecular protein-like substances (280,000 Da) and both protein and humic-like low molecular weight substances (400 Da). Concentrations of macromolecular protein-like substances decrease during the filtration. In the same time, fouling velocities decrease also during the filtration. Macromolecular protein-like substances have thus to be considered with attention in fouling study in MBRs. Moreover, the difference found in aeration is that the higher the air flow rate, the higher the concentration of macromolecular protein-like substances in the backwash water. Therefore, a higher aeration rate during filtration enhances fouling removability. This study emphasises the role of macromolecular protein-like substances in fouling and confirms the interest of aeration during filtration.