

Roles of various mixed liquor constituents in membrane filtration of activated sludge

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ABSTRACT

The roles of various mixed liquor constituents in the membrane filtration of activated sludge were investigated. Bench-scale filtration tests with four mixed liquor fractions (whole mixed liquor, mixed liquor supernatant, filtrate I (<8.0 μm), and filtrate II (<0.45 μm) or the soluble fraction) were carried out at different permeate fluxes. It was found that due to its high contents of organic carbon compounds, macromolecules and small supra-dissolved particles, which were most likely to adsorb onto and/or clog in the membrane structure, the soluble fraction (<0.45 μm) of mixed liquor ranked first in terms of its contribution to the total mixed liquor fouling, followed by the colloidal fraction (0.45–8.0 μm) and the un-settleable micro-floc fraction (>8.0 μm). In particular, the study revealed that large flocs were able to exert dual effects on membrane filtration. Depending on the hydrodynamic conditions, they could either act as membrane foulants causing fouling via particle deposition and cake formation, or serve as “moving filters” entrapping soluble and colloidal substances and thus alleviating the fouling. A “steric hindrance effect” mechanism was postulated to explain the positive effect of large sludge flocs on membrane filtration.

Keywords: Membrane fouling; Activated sludge; Soluble fraction; Mixed liquor constituents; Steric hindrance effect; MBR

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