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Nanofiltration performances after membrane bioreactor for hospital wastewater treatment: Fouling mechanisms and the quantitative link between stable fluxes and the water matrix

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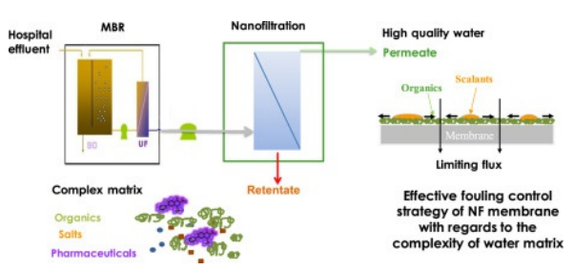
Abstract

Treatment combining membrane bioreactors (MBR) and nanofiltration (NF) is becoming an emerging wastewater treatment strategy. The combined process is capable of producing high quality water potentially reusable; however, diverse compositions of MBR effluents induce several types and degrees of NF membrane fouling that impacts process productivity. Moreover, since MBR effluent composition for one type of wastewater source is variable depending on the MBR efficiency at different periods, downstream NF membrane fouling types and degrees may consequently change over time.

In that context, the present paper aims at developing effective fouling control strategies of NF membrane in the case of the filtration of MBR effluents taken from a MBR system installed in a French hospital. These effluents were filtrated under various transmembrane pressures, and stable fluxes during these filtrations were determined. Several types and degrees of fouling mechanisms were then identified through surface morphology observation and the analysis of chemical compositions of fouled membranes. The diverse flux behaviour was further associated with the fouling mechanisms and foulant compositions. Based on the study of these mechanisms, the quantitative link between stable fluxes and calcium phosphate concentrations in MBR effluents has been established.

Graphical abstract



Keywords

Limiting flux, Stabilized flux, Organic fouling, Calcium and phosphate scaling, MBR effluent purification