

## Optimizing inline coagulation to reduce chemical consumption in MF/UF systems

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### ABSTRACT

Microfiltration/ultrafiltration (MF/UF) systems preceded by inline coagulation pretreatment are characterized by a high consumption of chemicals. For chemical consumption to be reduced, process conditions for inline coagulation (dose, pH, mixing, flocculation and temperature) should be optimized. In order to establish the optimum conditions for inline coagulation with different types of coagulants, their behaviour under different coagulation conditions needs to be understood. This study aimed at elaborating the behaviour of polyaluminium chloride (PACl) under different conditions of dose, pH, mixing (G) and flocculation (Gt) in the absence of turbidity and with low organic matter content. Tap water, filtered through a 0.1 mm PVDF filter was used as model water. Flocculated solutions were filtered in dead-end mode using an Amicon unstirred cell device. The specific cake resistance was quantified by measuring the modified fouling index (MFI) at a constant pressure of 1 bar and at 20°C. For low coagulant dose (1–5 mg Al<sup>3+</sup>/L) and low shear rate (<10 min flocculation time), pH control appeared to be the most important factor. At 5 mg Al<sup>3+</sup>/L, prolonged flocculation times (>30 min) resulted in lower MFI and higher pH values appeared to compensate for insufficient flocculation. In the presence of coagulant, the predominant filtration mechanism was cake filtration and pore blocking was not observed. The contribution of aluminium flocs to pressure increase in a UF membrane module, was not significant at dosing levels of 1–5 mg Al<sup>3+</sup>/L, and ranged from 1% to 5% depending on dose, pH and mixing conditions.

*Keywords:* Inline coagulation; Specific cake resistance; Modified fouling index

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