Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2020.26442

208 (2020) 210–215
December

Optimising powdered activated carbon dosing strategy in aspect of NOM removal and the floc strength

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Received 24 February 2020; Accepted 8 August 2020

ABSTRACT

Most previous studies have focused on the adsorption efficiency of powdered activated carbon (PAC). However, very few studies have investigated the floc properties produced in the coagulation–adsorption process. In the presented studies, the authors analyzed the effect of the PAC and the coagulant dosing strategy on adsorption–coagulation efficiency in the aspect of the removal of organic compounds and residual turbidity. The effect of the type of coagulant, that is, aluminum sulfate (alum) and high-basicity polyaluminum chloride (PACl), was also tested. The main purpose of the research aimed at investigating the impact of dosing strategies on floc strength. It was found that the removal efficiency of natural organic matter noted as absorbance UV254 was very high and did not depend on the PAC dosing strategy. PAC dosing before coagulant (strategy 1) resulted in a decrease of absorbance UV254 in filtered samples from 21.05 m^{-1} in raw water to 2.95 and 2.0 m^{-1} for PACl and alum, respectively. Simultaneous reagent dosing strategy (strategy 2) and coagulant followed PAC dosing (strategy 3) resulted in similar effects. However, the dosing sequence of PAC and coagulant was decisive for residual turbidity and the strength of flocs produced in coagulation–adsorption processes. Both strategies, that is, 2 and 3 were ineffective. In strategy 2 the final turbidity was 14.36 NTU for PACl, 15.24 NTU for alum and in strategy 3 turbidity was noted at 12.78 NTU for PACl and 18.53 NTU for alum. It was demonstrated that the most resistant to breakage were flocs produced in a sequence of PAC dosing before PACl. It was mainly confirmed by the least color increase in floc breakage tests. After the sedimentation stage, the color was noted at 107 CU for PACl and 155 CU form alum. The results also demonstrated that independently of the PAC dosing sequence, PACl flocs were less prone to rupture than alum flocs.

Keywords: Powdered activated carbon; Dosage strategy; Coagulation–adsorption; Floc strength

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