



Application of integrated microfiltration and PAC adsorption for the removal of humic acid as a pretreatment in seawater desalination

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ABSTRACT

This study evaluated the effectiveness of powdered activated carbon (PAC) in removing organic matter under saline condition with the application of microfiltration (MF). Adsorption isotherm test was conducted to compare the adsorptive potential of humic acid (HA) on PAC between reconstituted seawater and aqueous solution. Subsequently, two MF systems were run in parallel to investigate the effect of PAC and filtration process on HA removal. Various parameters such as turbidity, SDI_{15} , UV_{254} , dissolved organic carbon and transmembrane pressure were monitored within one-month operation. The batch experiment results showed that an increase in PAC concentration enhanced the adsorption potential of HA on activated carbon. Same trend was observed in the continuous experiment conducted with microfiltration. Percent removal of organics reached 60% for the control system while 90% for MF-PAC system. Lower SDI_{15} and turbidity values were obtained in the system with PAC. Adsorptive capacity of PAC with organic matter was higher in saline solution due to the ionic strength exhibited by salts present in seawater, and removal of humic acid in seawater was increased by the addition of activated carbon. Consequently, membrane filtration coupled with adsorption enhanced the removal of organic matter in reconstituted seawater producing better quality of effluent water.

Keywords: Adsorption; Desalination pretreatment; Humic acid; Microfiltration; Powdered activated carbon; Seawater

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