*Desalination and Water Treatment*
www.deswater.com
9 (2009) 155–164
September
1944-3994 / 1944-3986 
doi: 10.5004/dwt.2009.766

# Organic foulants in estuarine and bay sources for seawater reverse osmosis—Comparing pre-treatment processes with respect to foulant reductions

S.G. Salinas Rodríguez[a,b]*, M.D. Kennedy[a], J.C. Schippers[a], G.L. Amy[a,b]

[a]*UNESCO – IHE Institute for Water Education, Westvest 7, 2611 AX Delft, The Netherlands*
*email: s.salinas@unesco-ihe.org*
[b]*Delft University of Technology, Stevinweg 1 2628 CN Delft, The Netherlands*

Received 15 September 2008; Accepted 24 June 2009

**ABSTRACT**

Membrane fouling in seawater RO systems is a major operational problem. Not much is known about the role of natural organic matter in fouling of RO membranes. This study tries to characterize NOM for estuarine water and seawater sources, to present NOM analytical signatures of seawater from four different facilities at various locations, and to evaluate the effectiveness of pre-reatment in NOM removal. Focusing on organic (NOM) fouling, the analytical tools that have used in this research include: (i) liquid chromatography with on-line dissolved organic carbon detection (LC-OCD) and (ii) fluorescence excitation-emission matrix (F-EEM). Results showed in the case of seawater that humic substances represent ~50%, biopolymers ~10%, and building blocks and neutrals the remaining 40% of the DOC. In case of estuarine water, humic substances are ~65%, biopolymers ~10%, and building blocks and neutrals the remaining 25%. The evaluation of pre-treatment efficiencies revealed for the site A (seawater) that, DMF combined with inline coagulation is more effective than MF without coagulant addition in DOC removal (35% and 26% respectively); been the biopolymers removed by 47% and 36% respectively. For the site B (seawater), the beach wells removed 21% DOC, with the biopolymer fraction removed by ~70%. This is significant reduction in organic matter with size larger than 20 kDa. For site C (estuarine water), coagulation + continuous sand filtration removed 12% DOC and 17% biopolymers. The UF units removed nearly 70% of the biopolymers that were fed to the membranes. For site D (seawater), coagulation + single stage media filtration removed 12% DOC and 32% biopolymers. The deposition rates and deposition factors revealed that some organic matter is deposited on the RO membranes and large part of biopolymers are deposited on the membranes for site C and all organic matter fractions for site D.

*Keywords*: Natural organic matter; Seawater; Estuarine water; Pretreatment; Reverse osmosis; Deposition

* Corresponding author.

*Presented at the Conference on Membranes in Drinking and Industrial Water Production, 20–24 October 2008, Toulouse, France.*