



The fate of transparent exopolymer particles (TEP) in seawater UF-RO system: A pilot plant study in Zeeland, The Netherlands

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ABSTRACT

For many years, transparent exopolymer particles (TEP) were found abundant in various marine and freshwater environments, which are currently the main sources of raw water in desalination plants. Just recently, TEP have been identified as a potential foulant capable of causing organic and biological fouling in membrane systems. A pilot plant study was conducted to monitor the fate of TEP through the treatment process and to investigate their effects on the operational performance of a seawater UF-RO plant. Using spectrophotometric measurements, particulate (p-TEP > 0.4 µm) and colloidal (0.05 < c-TEP < 0.40 µm) species of TEP were measured at selected points in the plant. TEP monitoring in the raw water recorded a significant increase in both p-TEP and c-TEP starting in early spring (March). This period was also marked by an increase of chlorophyll-a and total organic carbon (TOC) mainly attributed to an algal bloom occurrence in the water source. Total TEP from the raw water were partially removed by the micro-strainer (11–21%) and the UF system (~28%). Low fouling rates in the UF were observed in January and February but severe fouling were observed in late March and April, coinciding with the increase in TEP level. The severe fouling was mitigated by applying in-line coagulation before the UF for which irreversible fouling was significantly reduced. Deposition analyses indicated that significant amounts of p-TEP and c-TEP were deposited in the RO system. However, there was no significant decrease of RO normalized flux during the 4 months of operation in the plant. Long term monitoring is needed to better assess the adverse effects of TEP accumulation in the RO systems.

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