Dual-stage nanofiltration seawater desalination: water quality, scaling and energy consumption

Jie Liu\textsuperscript{a}, Lixin Xie\textsuperscript{b,c,*}, Zhi Wang\textsuperscript{b,c,d}, Junsheng Yuan\textsuperscript{a}

\textsuperscript{a}Engineering Research Center of Seawater Utilization Technology of Ministry of Education, Hebei University of Technology, Box 307, No. 8, Guangrong Road, Tianjin 300130, P.R. China
\textsuperscript{b}Chemical Engineering Research Center, School of Chemical Engineering and Technology, Tianjin University, No. 92, Weijin Road, Tianjin 300072, P.R. China
\textsuperscript{c}Tianjin Key Laboratory of Membrane Science and Desalination Technology, Tianjin University, No. 92, Weijin Road, Tianjin 300072, P.R. China
\textsuperscript{d}State Key Laboratory of Chemical Engineering, Tianjin University, Tianjin 300072, P.R. China

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\textbf{ABSTRACT}

A dual-stage nanofiltration (NF) seawater desalination process was investigated as a novel seawater desalination technology, focusing not only on the permeate water quality, but also on the scaling possibility and energy consumption. Dow Filmtec\textsuperscript{TM} NF90 was used in the experiment for its high rejection of total dissolved solids (TDS). The results show that the permeate TDS from the second stage could be as low as 200 mg/L under an optimized condition. The operating pressures were only 3.5 MPa in the first stage and 2.0 MPa in the second stage. Operation pressure had the most significant effects on water permeate flux and TDS. Several indices were calculated to investigate scaling probability. The results indicate that scaling could occur in the first stage. Thus, a prevention method would be needed. The effects of the operating parameters on the energy consumption were also examined. The results indicate that dual-stage NF seawater desalination is a feasible technology in the view of water quality and energy consumption.

\textit{Keywords}: Dual-stage nanofiltration (NF); Seawater desalination; Scaling; Energy consumption