Evaluation of ceramic membrane applications for water treatment plants with a life cycle cost analysis

Sung Hyuk Park\textsuperscript{a}, Yong Gyun Park\textsuperscript{b}, Jae-Lim Lim\textsuperscript{c}, Suhan Kim\textsuperscript{d,*}

\textsuperscript{a}Advanced Process and Materials R\&BD Group, Korea Institute of Industrial Technology, Gaebol-ro 156, Yeonsu-gu, Incheon, Republic of Korea

\textsuperscript{b}Environmental Process Design Team, GS Engineering and Construction Corporation, 33 Jongro, Jongrogu, Seoul, Republic of Korea

\textsuperscript{c}Water Management & Research Center, K-Water Institute, 1689 Yusongdaero, Yusong-Gu, Daejeon, Republic of Korea

\textsuperscript{d}Department of Civil Engineering, Pukyoung National University, 365 Sinseonro, Nam-gu, Busan 608-739, Republic of Korea, Tel. +82 51 629 6065; Fax: +82 51 629 6063; email: suhankim@pknu.ac.kr

Received 15 January 2014; Accepted 2 April 2014

\textbf{ABSTRACT}

Ceramic membranes have many advantages such as durability, chemical resistance, high flux, and long life span. However, they generally require relatively high initial investment cost compared to polymeric membranes when they are used for a water treatment process. Therefore, if ceramic membranes are considered to be applied to a water treatment plant (WTP), the life cycle cost (LCC) analysis should be performed to evaluate its economic feasibility. In this study, the capital and operational expense data of selected WTPs which have membrane filtration processes were used for their LCC analysis. Production capacity of the plants, membrane flux and life span, and costs of membrane modules and electricity were considered as key analysis factors. From the LCC analyses with various conditions including membrane costs and membrane flux, the correlation of the key design parameters was obtained that can make the ceramic membrane filtration more cost-effective compared to the polymeric membrane method. At present state, WTP with a ceramic membrane should increase the permeate flux to meet the economic feasibility, but it is expected to have a bright future because of the recent development of manufacturing technologies and increase of demand in many industries.

\textit{Keywords:} Treatment; Ceramic membrane; Life cycle cost (LCC); Water treatment plant design

*Corresponding author.

\textit{Presented at the 6th International Conference on the “Challenges in Environmental Science and Engineering” (CESE-2013), 29 October–2 November 2013, Daegu, Korea}

1944-3994/1944-3986 © 2014 Balaban Desalination Publications. All rights reserved.