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A review of the artificial neural network based modelling and simulation approaches applied to optimize reverse osmosis desalination techniques

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ABSTRACT

The current global issue of water scarcity has demanded for over-abstraction of conventional fresh-water resources. The states of water scarcity are anticipated to worsen, as by 2050 the population is estimated to reach 9 billion worldwide. Desalination is considered a solution to solve the water scarcity issues, as it is considered a drought-proof water source, which does not depend on climate change, river flows or reservoir levels. Moreover, membrane fouling is still the main “Achilles heel” for the effective operation of desalination systems. This makes the technology chemically, energetically and operationally intensive and requires a considerable infusion of capital. The application of an artificial neural network (ANN), the computing model inspired by the human brain, and its variants, have been developed that can optimize the operation of membrane-based desalination system through analyzing the complex experimental and real-time data. This review paper presents the recent trends and developments focussed primarily on the modelling and simulation of reverse osmosis (RO) plant using ANN to solve the challenging problem in membrane-based desalination systems. The literature review suggested that ANN has a potential application in predicting linear, nonlinear, complicated complex systems with high accuracy and with better control, prediction of membrane fouling, cost analysis. Therefore, ANN considered a strong basis to attract and motivate the researchers to work in this field in the future.

Keywords: Desalination; Modelling and simulation; Reverse osmosis; Artificial neural network

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