



Design of ILEDR for brackish groundwater: A literature review approach

Maung Thein Myint^{a*}, Abbas Ghassemi^a, Nagamany Nirmalakhandan^b

^a*Institute for Energy and the Environment, New Mexico State University, MSC WERC, P.O. Box 30001, Las Cruces, NM 88003, USA*

^b*Civil Engineering Department, New Mexico State University, MSC 3CE, P.O. Box 30001, Las Cruces, NM 88003, USA*

Tel. +15756462073; fax +15756465474; email: mmyint@nmsu.edu

Received 31 July 2009; accepted 30 May 2010

ABSTRACT

A literature review was done in details in desalination by using electrodialysis reversal (EDR). All available data – source of water entered into pretreatment and/or directly into EDR, physico-chemical characteristics of water, targeted pollutants, methods and the reasons for the pretreatments, specifications used of EDRs, developments/improvements in EDR, fouling causing compounds and methods to control fouling, membrane types, membrane assembly, spacer, and concentrate management, method, and recovering of ions were searched and summarized in Tables 1–3. From the tables, the concentrations profiles of the targeted pollutants were observed in different sub-processes (i.e., pretreatment, ERD dilute and concentrate streams). The percentage removals of individual ion from different literatures were compared. The concentrations of fouling causing compounds (for examples, CaSO₄ and MgSO₄) in concentrated streams were eliminated by individual separation process with the specific different types of permselective membranes in four different stages. All these summarized data were used as tools, references, and comparisons to design and select the sub-processes in ILEDR project to treat the brackish groundwater into the drinking water. Design includes designs I (using a single type of membrane pair) and II (using four different types of mono- and di-valent permselective membrane). Permselective membrane design shows 7% cost saving while comparing to the single type of membrane design with the same water recovery rate, the same demineralization rate, and the same membrane life. The saving increases up to 15–18% if membrane life is considered in the design.

Keywords: CaSO₄ and MgSO₄ scaling eliminating by design; Desalination; Inland electro-dialysis reversal; Membrane fouling; Permselective membrane

*Corresponding author