Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2020.26076

198 (2020) 140–150
September

Seawater desalination by separating micro and nano salt particles with the use of magnetic and electric fields

Mohammad Vahedi Nejad, Hamid Reza Nazif*

Department of Mechanical Engineering, Imam Khomeini International University, Ghazvin, Iran, email: h_nazif@yahoo.com/nazif@eng.ikiu.ac.ir (H.R. Nazif)

Received 22 July 2019; Accepted 6 May 2020

ABSTRACT

In this research, a seawater electric-magnetic desalination system was studied and simulated. For the separation of salt particles with nano and micro sizes, the intensity of the electric and magnetic field and the seawater velocity play a dominant role in the separation system. The results for different variables such as magnetic and electric field, different diameters of particles, the inlet aspect ratio of the separator, and fluid flow rates were reviewed. It was observed that the separation efficiency of the electric-magnetic method decreased abruptly by 5% for the particles smaller than 100 nm. In addition, by increasing the aspect ratio, the percentage of particle discharge from the clean water zone decreased and the number of particles adsorbing to the electric and magnetic walls increased. Moreover, with increasing fluid velocity, the amount of particulate adsorption in the vicinity of the magnetic walls was significantly reduced. In this study, for a unit with dimensions of 60 cm × 10 cm × 20 cm and the particle input mass of 0.1 kg/s with a mean efficiency of 60% in voltage of 1 V and the magnetic field of 0.2 Tesla, the sweet water particles rate reduces to 0.006 kg/s.

Keyword: Multiphase flow; CFD; Desalination; Particle separation; Electric-magnetic force

* Corresponding author.