Engineering Analysis with Boundary Elements
Volume 151, June 2023, Pages 216-226

The use of machine learning in the analysis of thermal entropy, friction and total entropy in solar desalinated water with the presence of alumina nanoparticles by numerical method

Dan Wang [a b c], Masood Ashraf Ali [d] ✉, As'ad Alizadeh [e] ✉, Sattam Fahad Almojil [f], Kamal Sharma [g], Abdulaziz Ibrahim Almohana [f], Abdulrhman Fahmi Alali [f]

https://doi.org/10.1016/j.enganabound.2023.02.044

Abstract

A reduction in the environmental impact of energy consumption can be achieved through the integration of renewable energy with desalination. In this paper, a simulation of a solar desalination plant was performed using the finite element method. A small amount of alumina nanoparticles was added to the salt water in the desalination water. Two-phase method was used for its analysis. By changing the wall height parameters from 5 to 20 cm, the glass angle from 10 to 45° and the ambient temperature from 10 to 55°, the entropy (ENT) values produced in desalination were studied. Thermal ENT, friction ENT and total ENT were studied by changing the parameters and an optimization was done on the parameters to have the lowest ENT production in desalination using machine learning. The results of this study showed that the thermal ENT was greater than the friction ENT in the desalination water. An increase in ambient temperature has reduced some of the ENT production of friction, thermal ENT and total ENT. Increasing the height of the desalination wall has less effect on the ENT production and it can be seen that the increase of the desalination wall height has increased the production of thermal ENT and total ENT, but its further increase has decreased the production of thermal ENT and total ENT.