



Influence of operating parameters on performance of air-gap diffusion distillation device in desalination

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ABSTRACT

Freshwater on the Earth is in short supply, and water resources are unevenly distributed. In order to solve the problem of water shortage, countries are striving to develop desalination technology. In this study, we described the calculation and experiment of the air-gap diffusion distillation (AGDD) in seawater desalination with MATLAB. The influence of the operating parameters was studied. The results showed that the inlet temperature of the hot liquid had a greater influence on the heat transfer coefficient than the cold liquid. Under the same conditions, the inlet temperature of the hot liquid increased 10°C, the local heat transfer coefficient increased 42.5%; but the inlet temperature of the cold liquid increased 10°C, the local heat transfer coefficient only increased 6%. And when the thickness and height of air-gap, inlet temperatures of cold and hot fluid, the mass flow rate of cold fluid were 5 mm, 0.9 m, 20°C, 65°C and 5 kg h⁻¹ respectively, the water production flux is up to 0.937 kg m⁻² h⁻¹, and the water recovery rate is 3.37% which is much higher than similar research about air-gap membrane distillation. During the experiment, changes in operating parameters had no effect on the desalination rate of AGDD, and its desalination rate was higher than 99.8%.

Keywords: Air-gap diffusion distillation; Local heat transfer coefficient; Desalination

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