

Performance analysis of an integrative unit for air conditioning and desalination

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ABSTRACT

This paper presents a new innovative system for air-conditioning and desalination driven by a mechanical vapor compression cycle. The distillation process efficiently utilized the latent heat of ambient air by using the surface temperature of the evaporator coil. The production of fresh water depends on the specific humidity of the atmospheric air. The humidifier unit is the key component that separates the salt from the saline water; hence, it is specially designed and fabricated to obtain high heat and mass transfer. This experimental study highlights the production of fresh water of 95 kg/d with the circulation of 69.4×10^{-3} kg/s of seawater combined with the refrigeration effect of 3500 W with a compressor power of 614 W. The water obtained has a concentration of 105 ppm of total dissolved solids (TDS) with the PH of 6.8, which can be considered as the attributes of drinking water. The performance of the desalination unit is found to be 4.2. This system also has unique features such as moderate installation and operating costs, with simplicity in the production of fresh water.

Keywords: Desalination; Vapor compression; Evaporative cooling; Humidification

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