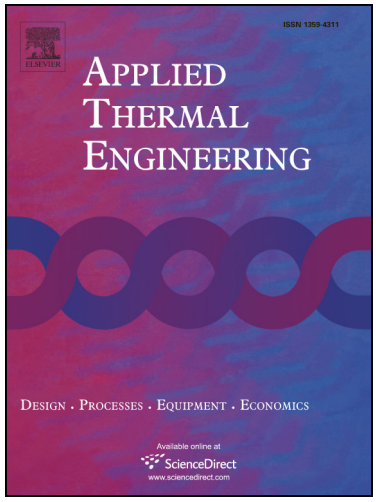

Research Paper

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Enhancement of Heat and Mass Transfer Performance on Humidification Tower Using Injection of Different Carrier Gases into Water Bed

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Abstract

The present study is presented an approach attempting for enhancement of heat and mass transfer between a continuous gas phase and liquid phase in a non-packed humidification towers by injection of different carrier gases such as air, carbon dioxide and helium through water bed. The computational technique utilized was a three-dimensional Navier-Stokes solver in the laminar flow regime with free-surface simulation in Piecewise Linear Interface Construction method to compute density variation on the two-dimensional two-phase flow field and pressure on a water bed. This work studied the influence of the operating conditions such as the water bed temperature and carrier gas type on the overall gas phase heat and mass transfer coefficient. The present study included also determining the overall pressure drop of the carrier gases through water bed, consumed power and humidification efficiency. It has been found that the mass transfer coefficient increases with increasing carrier gas molecular weight. The heat transfer coefficients are more than 5 times for carbon dioxide than air flow and less for helium than air, about 50% flow at water bed temperature 353 K. The mass transfer coefficients are more than 2.5 times for helium than air and less for carbon dioxide than air, about 50% at water bed temperature