Paper 154

Edit Final Version

Go To Submission

Title	Energy Performance Analysis of Dew Point Evaporative Cooler with Novel Heat and Mass Exchanger Design
Submitted	December 10, 2023 to ICCHMT2023
Category	Paper
Status	final
History	6 previous version(s)

Authors

Contact Authors

Mohammed Sulaiman
Erbil Polytechnic University, Mechanical and Energy Engineering Department, Erbil, Iraq

A
Ahmed M. Adham
Department of Technical Mechanical and Energy Engineering, Erbil Technical Engineering College, Erbil Polytechnic University, Kurdistan Region, Erbil 44001, Iraq
ahmed.adham@epu.edu.iq

Abstract

This paper investigates the energy performance of a novel dew point evaporative cooler (DPEC) with a new shell and tube design heat and mass exchanger. The shell is assigned as a wet channel, and the tubes are assigned as dry channels. The results obtained from the numerical simulation have been validated against the experimental data and compared to the conventional DPEC, namely, flat-plate type DPEC, under a wide range of operational and geometrical conditions. The obtained results revealed that, when compared to the conventional flat-plate type, the energy efficiency has significantly improved (as high as 35%) due to a significant decrease in pressure drop, which eventually led to lower power consumption for the same amount of air flowrate alongside with the increase in heat and mass transfer potential. In addition, it was found that the new cooler recorded the best performance when the channel diameter was smallest (about 3.9 mm); meanwhile, the channel length of 1.3 m, air velocity of 1.7 m/s, and air ratio of 0.3 are found to be the optimum values which resulted in the best energy performance for the proposed cooler.