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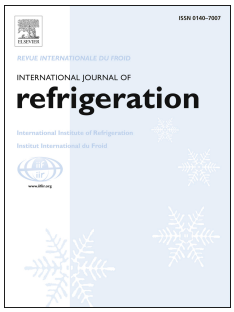

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The Effects of Fin-and-Tube Evaporator Geometry on Heat Pump Performance under Dehumidifying Conditions

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Abstract

A heat pump tumble dryer model was developed to investigate the effects of evaporator geometry on drying time and energy consumption. The model was validated using experimental data available in the literature. The effects of the evaporator's geometrical specifications on heat and mass transfer and pressure drops on both sides of the evaporator were investigated. Then, the energy consumption and drying time of the dryer were determined. The results indicated that the energy consumption is reduced by 12% when the number of rows in the evaporator is increased from 2 to 4. Increasing the number of columns from 2 to 4 could reduce energy consumption by 8%. The energy consumption increases by 18% when the outer diameter of the tube is increased from 6 mm to 10 mm. Increasing the longitudinal tube pitch from 10 mm to 30 mm leads to a 21% increase in energy consumption.

Keywords: Evaporator, heat pump tumble dryer, modeling, energy consumption

1. Introduction

Technological developments are progressively extending the use of heat pump tumble dryers. There are various studies in the literature concerning both heat pump tumble dryers and evaporators, which are the components through which the moisture extracted from clothes is condensed and vented from the system.

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