

Advances in Clothes Tumble Dryers: A Review

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Abstract

The clothes dryer market has been continuously increased worldwide and numerous studies have been conducted to improve energy efficiency as well as drying efficiency of the clothes dryers. In this study, a comprehensive review of the literature on the advance in clothes tumble dryers is conducted including the conventional dryers and recent advanced dryers as well. The reviewed papers are broadly divided into three main sections: exhaust-type dryers, closed-loop heat pump dryers, and drying efficiency improvement technologies. The exhaust-type dryers section includes energy saving of the air cycle heat pumps and exhaust-type heat pump dryers, which recovers the emitted heat to the ambient air. Furthermore, a review of recent progress in the closed-loop heat pump dryers, including improvement of cycle components and control strategy of superheating and air temperature, is conducted. In addition, drying efficiency improvement technologies are reviewed to investigate the effects of the drum rotational speed, air flowrate, amount of clothing, and air flow leakage on the drying performance. Finally, visualization studies on the clothing behavior in the tumble as well as studies on the data learning method for heat and mass transfer model of clothes are introduced. This study provides an informative summary of the advance in clothes tumble dryers and gives a clear insight into the research trend on clothes dryers.

Keywords: clothes dryer, heat pump, evaporative drying, energy efficiency, drying efficiency