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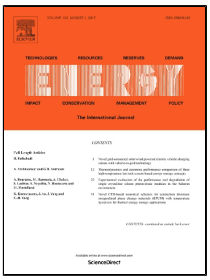

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An Energy-Efficient Method for Direct-Contact Ultrasonic Cloth Drying[I]

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Abstract

A novel ultrasonic transducer driving method, in which the power supply to the transducer is regulated by a binary modulating signal, is introduced for the first time for use in direct-contact ultrasonic drying of fabrics. First, the drying characteristics of different fabrics on two types of transducers are studied using continuous transducer driving mode. Then, the effects of duty cycle and frequency of modulating power signals on fabric drying characteristics are investigated. The energy efficiency of the proposed transducer driving method is compared with that of the continuous transducer driving mode. The results suggest that drying using a modulating signal consists of nonlinear and linear regimes similar to those of the continuous driving mode. The results also show that drying time of a fabric depends not only on the fabric type, but also on the duty cycle and the modulating frequency. However, there exists a critical duty cycle beyond which the drying time does not change. The proposed transducer driving method is more energy-efficient compared to continuous driving mode, consuming 7–16 times less energy. Higher energy efficiencies maybe achieved by operating the transducer at higher modulating frequencies and shorter duty cycles.

Keywords: Ultrasonic cloth drying; Duty cycle; Modulating frequency; Energy factor