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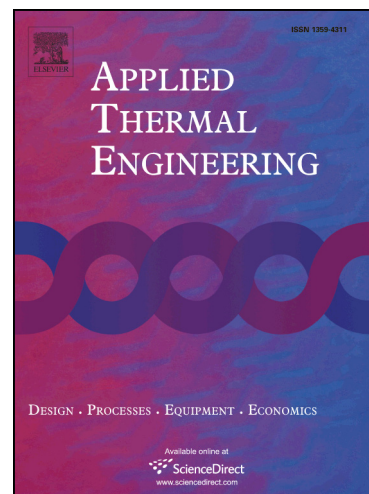
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Performance analysis of a new heat pump driven multi-stage fresh air handler using solid desiccant plates

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Abstract

A heat pump driven multi-stage fresh air handler using solid desiccant plates is proposed in this paper. This system can be operated under four modes depending on the outdoor air temperature and humidity ratio. This paper discusses the performances of the system under the solid desiccant dehumidification mode, which realizes a desired supply air humidity ratio with lower power consumption by adjusting the activated stage number according to the process air inlet temperature and humidity. First, influences of the total thickness of desiccant plates, the total stage number and the switching period on performances of this system were analyzed under Beijing summer condition. After the power consumption of both the compressor and the fans considered, a four-stage system with the total thickness of desiccant plates being 240 mm was suggested. Next, the optimal activated stage number under four typical working conditions of Beijing summer cooling period were discussed based on the suggested system. It was found that when the outdoor air humidity ratio were lower than $14 \text{ g}\cdot\text{kg}^{-1}$, the suggested active stage number was 2 to 3.

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