

Influence of Plate Geometry on Sensible Effectiveness of Fixed-Bed Regenerators

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Abstract – Fixed-bed regenerator (FBR) is one type of air-to-air energy exchanger used to reduce the energy consumption in HVAC systems. Use of corrugated plates is one way to improve the heat transfer performance of FBRs. In this study, the sensible effectiveness and average heat transfer coefficient of an FBR with corrugated plates are compared with that of an FBR with parallel plates. The effectiveness of corrugated plate FBR is experimentally evaluated in a small-scale test facility. A validated numerical model is used to predict the performance of the parallel plate FBR. The average heat transfer coefficient of corrugated FBR is determined from the measured data and Kays and London regenerator correlation. The heat transfer coefficient and effectiveness of corrugated plate FBR are 150% and 37% higher than that of parallel plate FBR at a Reynolds number of 1450. Results from the present study can be used to design FBRs and evaluate their effectiveness for a range of Reynolds numbers from 500 to 1450.

Keywords: Fixed-bed regenerators, Sensible effectiveness, Performance testing, Corrugated plate FBR