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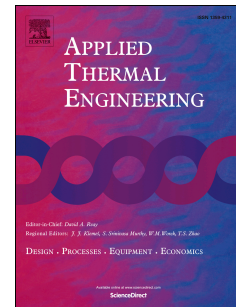
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Optimization of Louvered-fin Heat Exchanger with Variable Louver Angles

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ABSTRACT

The optimization of the variable louver angle ($\Delta\theta$) and initial louver angle (θ_i) for a louvered-fin heat exchanger was determined numerically using the conjugate gradient method. The area reduction ratio relative to a plain surface was the objective function to be maximized. A search for the optimal variable louver angle ($\Delta\theta$) and initial louver angle (θ_i), in the ranges of $+0^\circ < \Delta\theta < +4^\circ$ and $18^\circ < \theta_i < 30^\circ$, respectively, was performed. The results show that the maximum area reduction ratios are 48.5%~55.2% for the optimal design of ($\Delta\theta, \theta_i$) at $Re_H = 133\sim1199$ ($U_{in} = 1.0 \sim 9.0$ m/s).

In order to validate the reliability of the numerical simulation procedure, a comparison of experimental and numerical simulation results was made with the scaled-up testing. This article shows the temperature for the scaled-up louvered fin as determined from infrared thermovision and numerical simulation, respectively. A comparison of images shows that both methods give similar temperature distributions across the entire louvered fin. In addition, it shows comparisons of j and f between the simulation and experimental results. The results show good agreements, with a maximum discrepancy of 12%.

Keywords: Optimization, Variable louver angle, Conjugate gradient method, Louvered-fin heat exchanger

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