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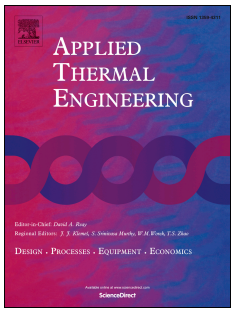

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Jiin-Yuh Jang, Professor, Chun-Chung Chen

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Optimization of Louvered-fin Heat Exchanger with Variable Louver Angles

Jiin-Yuh Jang* and Chun-Chung Chen

Department of Mechanical Engineering, National Cheng Kung University, Tainan 70101, Taiwan

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°< $\Delta\theta$ <+4° and 18° < θ_i < 30°, respectively, was performed. The results show that the maximum area reduction ratios are 48.5%~55.2% for the optimal design of ($\Delta\theta$, θ_i) at Re_H = 133~1199 (U_{in} = 1.0 ~ 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

*Professor, author to whom correspondence should be addressed

Tel: 886-6-2088573 Fax: 886-6-2753850

E-mail: jangjim@mail.ncku.edu.tw