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Numerical Prediction of Entropy Generation in Heat Exchangers

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Abstract : The concept of second law is assumed to be important to optimize the energy losses in heat exchangers. The present study is devoted to the numerical prediction of entropy generation due to heat transfer and friction in a double tube heat exchanger partly or fully filled with a porous medium. The goal of this work is to find the optimal conditions that allow minimizing entropy generation. For this purpose, numerical modeling based on the control volume method is used to describe the flow and heat transfer phenomena in the fluid and the porous medium. Effects of the porous layer thickness, its permeability, and the effective thermal conductivity have been investigated. Unexpectedly, the fully porous heat exchanger yields a lower entropy generation than the partly porous case or the fluid case even if the friction increases the entropy generation.

Keywords : heat exchangers, porous medium, second law approach, turbulent flow
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