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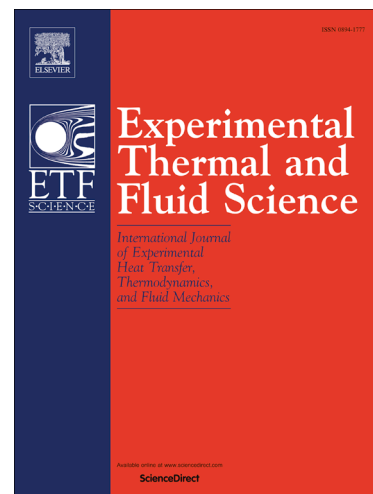
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Experimental study on single-phase flow in horizontal internal helically-finned tubes: the critical Reynolds number for turbulent flow

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Abstract: A correlation of the critical Reynolds number for turbulent flow in horizontal helically finned tubes is proposed in this study based on the analysis of experimental data from the current and six previous studies. In the experiment, the main parameters of the two tubes (Tube-1 and Tube-2), include the number of fin (N_s), helix angle (α), and the ratio of fin height to diameter (e/D_i), which are 38 and 60, 60° and 45° , and 0.0534 and 0.0222, respectively. Aqueous ethylene glycol was used as the test fluid. Pressure drop data were obtained under isothermal condition with Reynolds number spanning from 3100 to 39500 and Prandtl number spanning from 13.8 to 49.2. Results showed that the critical Reynolds numbers for turbulent flow in Tube-1 and Tube-2 were 11000 and 17000, respectively. The proposed correlation, which correlated the critical Reynolds number with four parameters (i.e., e , D_i , α , and N_s) and a constant, predicted all the 14 groups of critical Reynolds number within 10% and could be applicable to internal helically finned tubes with $0.01 < e/D_i < 0.0534$, $18^\circ < \alpha < 60^\circ$, and $25 < N_s < 82$. This work offers a reference for the general correlation for heat transfer coefficient and friction factor of the internal helically finned tubes.

Keywords: Internal helically finned tube; Friction factor; Single-phase; Critical Reynolds number

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