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**Experimental investigation on the friction characteristics of water–ethylene glycol
mixture flow in internal helical finned horizontal tubes**

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Abstract

Internal helical finned tubes are widely applied in the HVAC field because they enhance convective heat transfer. In this study, an experimental setup was built and used to investigate the single-phase flow characteristics of internal helical-rib roughness covering laminar and transition regimes. The single-phase flow characteristics of two internal helical finned tubes were also determined. The setup contained two test tubes, with nominal diameters of 22.48 and 16.662 mm, number of fins of 60 and 38, helix angles of 45° and 60°, and relative roughness values of 0.022 and 0.053, respectively. The Prandtl number varied from 15 to 177, and the Reynolds number ranged from 200 to 36000. Friction factors were accurately measured under the adiabatic condition. Analysis results of the plain tube were in agreement with those obtained using the Filonenko equation. The first critical Reynolds numbers that judged the transition from laminar to transition regimes were 2160 for Tube-1 and 2070 for Tube-2. The second critical Reynolds numbers that judged the start of fully turbulent regime were 14300 for Tube-1 and 9500 for Tube-2. The entrance region

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