Experimental Investigation of Turbulent Heat Transfer by Counter and Co-Swirling Flow In A Flat Tube Fitted With Twin Twisted Tapes

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ABSTRACT

The use of inserts has gained extensive attention due to their role in improving the efficiency of thermal systems. In this study, an experimental investigation was conducted to explore the effect of twin counter and co-twisted tapes on heat transfer rate (*Nu*), friction factor (*f*) and thermal enhancement index (η). The twin counter twisted tapes (CTT) and twin co-twisted tapes (CoTT) were used as swirl flow generators in a test section. The tests were conducted using the CTT and CoTT with three different twist ratios (H/D) = 5, 10 and 15) for Reynolds numbers range between 7200 and 32,400 under uniform heat flux conditions. The results show that Nusselt number (*Nu*), friction factor (*f*) and thermal enhancement index (η) increase with decreasing twist ratio (H/D) and the CTT is more efficient than the CoTT for heat transfer enhancement. Within the scope of this study, heat transfer rates in the flat tube fitted with the CTT are around 22.5% and 61% higher than those with the CoTT and plain flat tube, respectively. The maximum thermal enhancement index (η) obtained at the constant flow rate by the CTT with H/D = 5, 10 and 15, are 1.58, 1.44 and 1.15 respectively, while those obtained using the CoTT with the same range of H/D are 1.43, 1.19 and 1.04, respectively. Furthermore, the empirical correlations of the heat transfer (*Nu*), friction factor (*f*) and thermal enhancement index (η) are also reported.

KEYWORDS: Heat transfer coefficient; Friction factor; Twin twisted tape; Flat tube

DOI: 10.1016/j.icheatmasstransfer.2016.04.021