Investigation of a Novel High Temperature Heat Exchanger with Hybrid Internally and Externally Finned Tubes

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Abstract

In this paper, a novel HTHE with hybrid internally and externally finned tubes is presented with the help of an improved heat exchanger design program. It can be used in high temperature environment, such as the waste heat recovery system and high temperature reactor. The proposed HTHE can be divided into two regions according to different temperatures of tube walls. H-type fins and twisted-tape insertions are welded inside and outside the tubes in high temperature region, respectively. Wave-like longitudinal fins are welded inside the tubes in low temperature region. Thermal calculations are performed to determine the heat transfer characteristic of the HTHE with a similar twisted-tape-inserted tube HTHE as comparison. The effectiveness and pressure drop are obtained at the gas temperature between 600 °C and 900 °C. The calculation results indicate that the volume flow-rate on both sides has significant effects on pressure drop, while the effectiveness has a small increment as the gas temperature increases. Comparison between the novel HTHE and the traditional HTHE indicates that the proposed HTHE has better heat transfer performance.