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A Numerical Study on Fully Developed Fluid Flow and Heat Transfer in a Spiral Finned Tube

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摘要 In this paper, the standard k- ϵ two-equation model is adopted to numerically simulate fully developed fluid flow and heat transfer in a spiral finned tube within a cracking furnace for ethylene manufacturing. By variable transformation, the original 3-D problem is converted into a 2-D problem in spiral coordinates. The algorithm of SIMPLEC is used to study the fully developed fluid flow and heat transfer in the spiral finned tube at constant periphery temperature and constant axial heat flux. The computed results agree pretty well with the experimental data obtained from the industry. Further studies on the fluid flows and temperature profiles at different Reynolds numbers within straight and spiral finned tubes are conducted and the mechanisms involved are explored. It is found that with the spiral finned tube, pressure drop increases to a great extent whereas heat transfer tends to be decreased.

关键词 [fluid flow and heat transfer numerical simulation](#) [finned tube](#) [spiral finned tube spiral coordinates system](#)

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Abstract In this paper, the standard k- ϵ two-equation model is adopted to numerically simulate fully developed fluid flow and heat transfer in a spiral finned tube within a cracking furnace for ethylene manufacturing. By variable transformation, the original 3-D problem is converted into a 2-D problem in spiral coordinates. The algorithm of SIMPLEC is used to study the fully developed fluid flow and heat transfer in the spiral finned tube at constant periphery temperature and constant axial heat flux. The computed results agree pretty well with the experimental data obtained from the industry. Further studies on the fluid flows and temperature profiles at different Reynolds numbers within straight and spiral finned tubes are conducted and the mechanisms involved are explored. It is found that with the spiral finned tube, pressure drop increases to a great extent whereas heat transfer tends to be decreased.

Key words [fluid flow and heat transfer numerical simulation](#); [finned tube](#); [spiral finned tube spiral coordinates system](#)

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