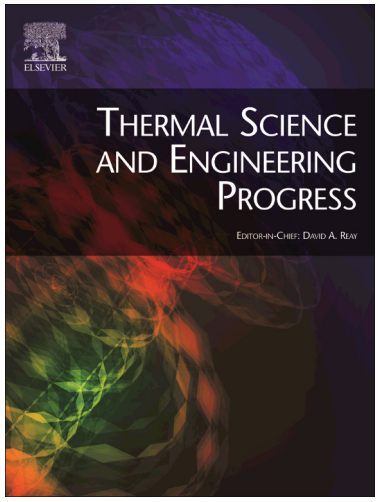

Thermal Performance of Mixed Tube Bundle Composed of Circular and Elliptical Tubes

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Abstract

A numerical study to determine forced convection heat transfer coefficient and pressure drop across mixed tube bundle (composed of circular and elliptical tubes) has been carried out in the present paper. The analysis is based on a 2-D computational domain consisting of five rows and three columns using commercial CFD package ANSYS 15-FLUENT module. The different configuration of mixed tube bundle for inline and staggered arrangement are considered for analysis. The variation of heat transfer coefficient and pressure drop across various configuration of mixed tube bundle has been investigated for different velocity input and variation in pitch to diameter ratio along vertical and horizontal direction. The Reynolds number and pitch to diameter ratio are varied from 100 to 2000 and 1.25 to 1.85 respectively. The study on convection over circular tube bundle is benchmarked with analytical solution and boiler design standard. The heat transfer coefficient and pressure drop of mixed tube bundle has been compared with circular and elliptical tube bundles. The heat transfer coefficient found to decrease from circular to mixed to elliptical tube bundle for given inlet velocity and pitch to diameter ratio. Similarly, for the same input parameters the pressure drop found to decrease from elliptical to mixed to circular tube bundle. The value of heat transfer coefficient and pressure drop are found to decrease with increase in pitch to diameter ratio and decrease in Reynolds number. The staggered mixed tube bundle has higher heat transfer coefficient and higher pressure drop as compared to inline arrangement. It is also observed that the variation of pitch to diameter ratio along horizontal direction affects heat transfer and pressure drop significantly as compared to the variation in vertical direction. It is concluded