THERMAL PERFORMANCE OF A CROSS FLOW HEAT EXCHANGER WITH SEMI-CIRCULAR TUBES

M. Moawed*
Faculty of Eng. Shoubra,
Benha branch, Zagazig Univ., Cairo, Egypt

ABSTRACT

In the present study, an experimental and numerical investigation of heat transfer and pressure drop of a cross flow heat exchanger with a bundle of semi-circular tubes are presented. The tubes are arranged in-line with a capability of changing the angles of attack. Four tested heat exchangers are used with different relative transverse pitches ($S_t/d$) while the relative longitudinal pitch ($S_L/d$) is kept constant. The angle of attack ($\theta$) is varied from $0^\circ$ to $270^\circ$ and the relative transverse pitch ($S_t/d$) is changed from 1.35 to 1.64. A numerical code is implemented to determine the heat transfer coefficient and pressure drop of a bundle of semi-circular tubes within the ranges of conditions employed in the experimental study. The experimental results showed that, the average Nusselt number ($Nu$), the average friction factor ($f$) and effectiveness ($E$) are strongly dependent on the angle of attack ($\theta$) and $S_t/d$. A comparison between the numerical and the experimental results showed that there is a good agreement between them. Also, the good agreement between the experimental results with the published data is observed.

Key words: Heat exchanger, thermal performance, cross-flow, semi-circular tubes.

*Corresponding author:
E-mail: mmoawed@hotmail.com (M. Moawed)