NUMERICAL STUDY CHARACTERISTICS OF FLOW AND HEAT TRANSFER CROSS-FLOW STAGGERED TUBE ARRANGEMENT USING VARIATIONS TRANVERSE DAN LONGITUDINAL FITCH

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ABSTRACT

The characteristic of fluid flow and heat transfer on a circular cylinder with particular pattern is frequently used in various branches of modern technology today. The practical application is extensively used in the world of industry such as to determine tube structure design on system of heat exchangers, refrigeration, air conditioner, cooling tower, chemical process, electronic cooling, protector structure of cable network etc. The amount of heat transfer when fluid current passes through circular cylinder is expressed by Nusselt number parameter, either local Nusselt number \( \text{Nu}_\Phi \) or average Nusselt number.

Forced convection heat transfer on the circular cylinder with a staggered-type of using 3 Reynolds number \( \text{Re}_D \) varied as the value of 80, 200, 5000 while the tranverse pitch \( (1.5D, 2D) \) and longitudinal pitch \( (1.5D, 2D) \). The fluid inlet temperature entering shell is 350 °K and the tube temperature is 300 °K, which is modeled with Gambit 2.4.6 and simulated using Fluent 6.3.26 with turbulent model \( k-e \) SST 2D steady-flow to obtain data related to the velocity profile and temperature distribution.

From the simulation results obtained visualization contour of velocity, temperature and Nusselt number distribution. An increase in heat transfer with decreasing tranverse pitch \( (S_T) \) and longitudinal pitch \( (S_L) \). At \( \text{Re}_D 200 \), a decline in the value of the average Nusselt number in the third row and fourth grades, while at \( \text{Re}_D 5000 \) the average Nusselt number in the second row, third and fourth constantly increasing.

Key Words: Heat Transfer, Circular Cylinder, tranverse, longitudinal, Staggered and Tube Bank.