INTISARI

Alat penukar kalor *shell and tube* di industri harus dirancang berbasis standar tertentu yaitu TEMA. Jumlah *baffle* yang digunakan juga harus dipertimbangkan karena memiliki pengaruh signifikan pada unjuk kerja alat penukar kalor. Penelitian ini berfokus pada perancangan alat penukar kalor berbasis TEMA dan dilakukan simulasi unjuk kerja pada variasi jumlah *baffle*.

Penelitian ini melakukan perancangan alat penukar kalor berbasis TEMA. Perhitungan *thermal* menggunakan 3 metode yaitu Kern, Bell Delaware, dan simulasi perangkat lunak HTRI. Variasi *baffle* dilakukan pada desain tanpa *baffle*, 1, 3, dan 5 *baffle.* Unjuk kerja *thermal* alat penukar kalor diamati pada nilai 80%, 90%, 100%, 110%, dan 120% dari desain laju aliran fluida panas. Variabel unjuk kerja *thermal* berfokus pada koefisien perpindahan kalor keseluruhan, laju perpindahan kalor, dan *pressure drop*.

Perancangan alat penukar kalor berhasil dilakukan dengan berbasis standar TEMA. Dimensi utama dari alat penukar kalor yaitu diameter luar 318 mm dan panjang *tangent line to tangent line* 2185 mm menggunakan 42 *tubes* dengan pengaturan *staggered* 30°. Hasil pengamatan pada jumlah *baffle* menggunakan metode Kern, Bell Delaware, dan HTRI memperlihatkan bahwa penambahan jumlah *baffle* meningkatkan nilai koefisien perpindahan kalor pada kisaran 1-1,5 $W/m^{2}°C$, laju perpindahan kalor sebesar 400-1000 J/s, dan *pressure drop* di *shell* pada nilai 1-14 kPa. Hasil variasi laju aliran massa memperlihatkan penambahan laju aliran massa juga meningkatkan koefisien perpindahan kalor, laju perpindahan kalor, dan *pressure drop* di *shell* yang sesuai dengan fungsi polinomial derajat dua.

Kata kunci : Alat Penukar Kalor *Shell and Tube*, TEMA, *Baffle*

ABSTRACT

Shell and tube heat exchanger shall be designed based on certain code namely TEMA for design acceptance. Number of baffle has also been considered since it has significant contribution to the performance. This research is focused on the design of heat exchanger based on TEMA, as well as its performance simulation on variation of number of baffle.

Heat exchanger is designed based on TEMA standard for this research. Methods for determining thermal calculation is designed using 3 methods namely Kern, Bell Delaware, and HTRI simulation. Baffle variation is carried out on without baffle and baffle of 1, 3, and 5. The thermal performance of heat exchanger is investigated on 80%, 90%, 100%, 110%, and 120% of hot fluid design flow rate. Thermal performance are focused on overall heat transfer coefficient, heat transfer rate, and pressure drop.

Results show that the heat exchanger are successfully designed based on TEMA. The main dimension of heat exchanger are 318 mm diameter and 2185 mm of tangent line to tangent line length with 42 tubes in staggered 30° layout. In the investigation of baffle number using 3 methods of Kern, Bell Delaware, and HTRI, it is shown that addition of baffle number increase the value of heat transfer coefficient, heat transfer rate, and pressure drop in shell. Adding of number of baffle increase the value of heat transfer coefficient in range of 1-1,5 $W/m^{2}°C$, heat transfer rate in range of 400-1000 J/s, and pressure drop in shell with range of 1-14 kPa. In the variation of mass flow rate, it is shown that increasing of mass flow rate also increase heat transfer coefficient, heat transfer rate, and pressure drop in shell. The trend line of values of overall heat transfer coefficient, heat transfer rate, and pressure drop in shell are fitted with functions of degree 2 polynomial.

Keywords : Shell and Tube Exchanger, TEMA, Baffle