INTISARI

Alat penukar kalor merupakan suatu alat yang berfungsi untuk mentransfer energi termal (*enthalphy*) antara dua fluida atau lebih pada suhu yang berbeda. Jenis alat penukar kalor yang banyak digunakan oleh industri adalah *shell and tube*. Perancangan alat penukar kalor *shell and tube* tanpa *baffle* pada dasarnya sudah memiliki perhitungan eksak. Di sisi lain, perancangan aalat penukar kalor dengan *baffle* melibatkan banyak faktor, seperti faktor *leakage*, faktor *bypass* dan faktor *window*. Untuk memprediksi unjuk kerja alat penukar kalor *shell and tube* dengan *baffle* dapat dilakukan simulasi CFD (*Computational Fluid Dynamic*).

Pada penelitian ini dilakukan perancangan alat penukar kalor *shell and tube* berdasarkan TEMA dan Bell-Delaware dengan data perancangan yang telah ditentukan. Hasil perancangan alat penukar kalor tersebut akan digunakan sebagai validasi simulasi CFD. Simulasi alat penukar kalor dilakukan dengan memvariasikan sudut *inclined baffle* sebesar 75^o, 60^o dan 45^o. Masing-masing sudut tersebut memiliki dua model konfigurasi yang berbeda.

Berdasarkan hasil simulasi, alat penukar kalor dengan sudut *segmental baffle* menghasilkan efektivitas sebesar 47,2% , sedangkan alat penukar kalor model pertama memiliki efektivitas sebesar 39,5% untuk sudut kemiringan *baffle* 45^o, efektivitas 42,17% untuk kemiringan sudut *baffle* 60^o dan efektivitas sebesar 44,6% untuk kemiringan sudut *baffle* 75^o. Alat penukar kalor model 2 menghasilkan efektivitas sebesar 32,99% untuk sudut kemiringan *baffle* 45^o, efektivitas 38,64% untuk kemiringan sudut *baffle* 60^o dan efektivitas sebesar 42,17% untuk kemiringan sudut *baffle* 75^o. Alat penukar kalor dengan kemiringan *baffle* memiliki nilai *pressure drop* yang lebih kecil dibandingkan alat penukar kalor *segmental baffle*. Alat penukar kalor *segmental baffle* menghasilkan nilai *pressure drop* sisi *shell* sebesar 256,37 Pa, sedangkan alat penukar kalor model 1 dengan sudut kemiringan *baffle* 45^o, 60^o dan 75^o menghasilkan nilai *pressure drop* sisi *shell* sebesar 170 Pa, 215 Pa dan 241,53 Pa. Alat penukar kalor model 2 dengan sudut kemiringan *baffle* 45^o, 60^o dan 75^o menghasilkan nilai *pressure drop* sebesar 153,7 Pa, 178,56 Pa dan 215,16 Pa.

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

ABSTRACT

A heat exchanger is a heat transfer device that is used for transfer of internal thermal energy between two or more fluids available at different temperatures. The most commonly used type of heat exchanger is shell and tube heat exchanger. The design of shell and tube heat exchanger without baffle has an exact formula. On the other hand, the design of heat exchanger with baffle involving many parameters like window effect, bypass effect and lekage effect. Therefore to ease for performance prediction of shell and tube heat exchanger with baffle could be done by doing simulation. Computational fluid dynamic simulation is one of method to predict performance of shell and tube heat exchanger.

This final project is focused on design calculation and numerical calculation of shell and tube heat exchanger which have counter-flow construction. Design and calculation of the shell and tube heat exchanger are based on TEMA standard and used Bell-Delaware method. Performance predicting is carried out using simulation with ANSYS in variable of angle of inclined baffle, i.e 75^o, 60^o and 45^o. Each of the angle variable of shell and tube heat exchanger has two configuration models. Validation is conducted by comparing the outlet temperature of shellside and tubeside segmental heat exchanger from datasheet with simulation result.

Based on the result of the simulation, shell and tube heat exchanger segmental baffle has better effectivity than inclined baffle. The effectivity of shell and tube heat exchanger segmental baffle is 47,2%, and the effectivity for the 1st model shell and tube heat exchanger with angle inclined baffle 45^o, 60^o and 75^o are 39,5%, 42,17% and 44,6%. On the other hand, the effectivity for the 2nd model shell and tube heat exchanger with angle inclined baffle 45^o, 60^o and 75^o are 32,99%, 38,64% and 42,17%. Based on the result of the simulation, shell and tube heat exchanger inclined baffle has better shellside pressure drop than segmental baffle. The value of shellside pressure drop of shell and tube heat exchanger segmental baffle is 256,37 Pa and the value of shellside pressure drop for the 1st model shell and tube heat exchanger with angle inclined baffle 45^o, 60^o and 75^o are 170 Pa, 215 Pa dan 241,53 Pa. On the other hand, the value of shellside pressure drop for the 2nd model shell and tube heat exchanger with angle inclined baffle 45^o, 60^o and 75^o are 153,7 Pa, 178,56 Pa dan 215,16 Pa.

Keywords : Shell and Tube Exchanger, TEMA, Simulation, Inclined Baffle