ABSTRAK

Fin and tube heat exchanger merupakan sarana yang digunakan sebagai pemindah panas. *Fin and tube heat exchanger* perlu ditingkatkan performanya karena timbulnya masalah pada area belakang *tube*. Masalah yang terdapat pada area belakang *tube* adalah munculnya *wake region*. Ukuran *wake region* dapat dikurangi dengan pengaplikasian *vortex generator*. *Vortex generator* dapat menciptakan *longitudinal vortices* yang dapat mengurangi ukuran *wake region* dan meningkatkan performa perpindahan panas.

Penelitian ini menggunakan dua jenis *vortex generator* tipe *open perforated delta winglet pairs* (OPDWPs) dan *open perforated delta winglet staggered* (OPDWS) pada *fin and tube heat exchanger*. Simulasi ini menggunakan bilangan Reynolds 2000 sampai 10 000 dengan interval 1000.

Dalam penelitian ini, ditemukan bahwa penggunaan OPDWPs dapat menghasilkan peningkatan performa perpindahan panas yang signifikan. Hasil penelitian menunjukkan bahwa Nusselt number tertinggi mengalami peningkatan sebesar 13,45% berkat penggunaan OPDWPs. Nilai *pressure drop* tertinggi sebesar 123% didapatkan pada penggunaan OPDWPs. Nilai *temperature outlet* tertinggi sebesar 0,31% didapatkan pada penggunaan OPDWS. Nilai LMTD tertinggi sebesar 0,64% didapatkan pada penggunaan OPDWPs. Nilai koefisien perpindahan panas tertinggi sebesar 13,45% didapatkan pada penggunaan OPDWPs. Susunan *vortex generator* juga beerpengarh terhadap kontur *streamline velocity* dan kontur suhu.

Kata kunci: *fin and tube heat exchanger, wake region, vortex generator, longitudinal vortices*, simulasi 3D.

ABSTRACT

The fin and tube heat exchanger is a tool used for heat transfer. Fin and tube heat exchangers need to improve their performance due to problems arising in the area behind the tube. The problem found in the area behind the tube is the emergence of a wake region. The size of the wake region can be reduced by applying a vortex generator. Vortex generators create longitudinal vortices that reduce the size of the wake region and improve heat transfer performance.

This study used two types of vortex generators, open perforated delta winglet pairs (OPDWPs) and open perforated delta winglet staggered (OPDWS), on a fin and tube heat exchanger. The simulation employed a Reynolds number of 2000 to 10,000 with an interval of 1000.

This study found that the use of OPDWPs can result in a significant improvement in heat transfer performance. The research results indicate that the highest Nusselt number increased by 13.45% due to the utilization of OPDWPs. The highest pressure drop value of 123% was obtained when using OPDWPs. The highest outlet temperature value increased by 0.31% with the implementation of OPDWS. The highest LMTD value increased by 0.64% with the utilization of OPDWPs. The highest heat transfer coefficient value increased by 13.45% when OPDWPs were employed. The arrangement of vortex generators also influences the contour of streamline velocity and temperature distribution.

keywords: *fin and tube heat exchanger*, wake region, *vortex generator*, longitudinal vortices, 3D simulation.