INTISARI

Utilisasi sistem *Organic Rankine Cycle* dalam keperluan *heat recovery* berkapasitas 5 kW dengan fluida kerja R245fa memerlukan perancangan komponen *heat exchanger* yang mewadahi proses perpindahan panas dari sumber panas ke fluida kerja serta untuk keperluan pendinginan fluida kerja. Salah satu jenis *heat exchanger* yang dapat digunakan adalah *gasketed plate heat exchanger*. GPHE digunakan dengan keunggulannya yang dapat mewadahi proses perpindahan panas yang membutuhkan luasan perpindahan panas yang besar. Perancangan HE dilakukan dalam empat proses, yaitu identifikasi sistem ORC, analisis termal dan *pressure drop* evaporator, analisis termal dan *pressure drop* kondensor, serta desain 3D dan *detailed engineering drawing*. Alur identifikasi dan analisis yang menggunakan perhitungan memanfaatkan software EES serta program Excel. Metode analisis termal menggunakan metode LMTD yang menyesuaikan proses analisa untuk GPHE dengan tujuan mengetahui nilai panjang plat yang berkorelasi dengan luasan yang dibutuhkan untuk mewadahi proses perpindahan panas. Sedangkan, analisis *pressure drop* dilakukan dengan meninjau empat faktor *pressure drop*, yaitu gesekan, akselerasi, koneksi, dan gravitasi. Identifikasi sistem ORC dengan fluida panas berupa *steam* serta fluida pendingin berupa air, memberikan besaran laju aliran massa di evaporator, yaitu 0,01899 kg/s untuk *steam* dan 0,1887 kg/s untuk R245fa, serta 1,691 kg/s untuk fluida pendingin di kondensor. Hasil identifikasi juga memberikan karakteristik dan kondisi tiap fluida di tiap posisi (data temperatur, tekanan, entalpi, kualitas, dan entropi). Dengan referensi dimensi GPHE berdasarkan *manufacturer* yang berjenis TL6-B, hasil analisis untuk evaporator memberikan informasi kebutuhan plat sebanyak 264 plat aktif. Di sisi lain, kondensor memerlukan sebanyak 87 plat aktif untuk mewadahi proses pendinginan R245fa. Desain disesuaikan dengan referensi GPHE dengan plat TL6-B yang digambar dengan standar ISO yang berlaku.

Kata kunci: ORC, GPHE, identifikasi, perancangan, *pressure drop*

ABSTRACT

Organic Rankine Cycle system utilization to perform heat recovery process generating 5kW power output with R245 as working fluid require heat exchanger design which will be holding heat transfer process between hot fluid and cold fluid and also working fluid cooling process. One of heat exchanger types available for this process is gasketed plate heat exchanger. GPHE is used because of its advantages especially supplying high heat transfer area. To design the heat exchanger, there are several process which has to be performed, such as ORC system identification, evaporator thermal and pressure drop analysis, condensor thermal and pressure drop analysis, and at last the 3D design and detailed engineering drawing. The identification and analysis process performed are using EES and Excel program. LMTD method is used for the thermal analysis process with the purpose of knowing the required plate length which is related to the required heat transfer area. In other hand, the pressure drop analysis process is performed by observing four factors causing pressure drop, which are gravitation, acceleration, port and connection, and friction. ORC system identification with steam as hot fluid and water as coolant, gives information about fluid mass flow in evaporator and condensor. Those mass flow are 0,01899 kg/s for steam, 0,1887 kg/s for R245fa, and 1,691 for water. The identification also give fluid characteristics and conditions in each position (temperature, pressure, enthalpy, quality, and entropy data of fluid). TL6-B GPHE reference which is produced by manufacturer is used for the thermal and pressure drop analysis process, giving the number of required plates which is 264 active plates for evaporator. In the other hand, the condensor requires 87 active plates to perform R245fa cooling process. The design is based on TL6-B GPHE reference and is drawn with ISO standards applied.

Keywords: ORC, GPHE, identification, design, *pressure drop*