ABSTRAK

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UPAYA PENGURANGAN PENGUAPAN AIR PENDINGIN PADA *EVAPORATIVE CONDENSER*

Skripsi, Fakultas Sains dan Teknologi (2021)

(xiv + 59 halaman, 8 tabel, 27 gambar, 7 persamaan rumus, dan 6 lampiran)

Proses pendinginan dibutuhkan karena adanya panas yang dihasilkan dalam pengoperasian mesin. Karena adanya hal tersebut, diperlukan peralatan perpindahan panas meliputi *cooler, condenser, heat exchanger*, dan lain-lain. Dalam industri, biasanya angin, oli atau air digunakan sebagai media pendingin. Di *condenser*, proses pendinginan ini terjadi. Saat ini, dalam proses pendinginan pada pabrik es, salah satu cara untuk menurunkan suhu media pendingin adalah menggunakan *cooling tower* dengan memindahkan panasnya ke lingkungan. *Cooling tower* memerlukan area yang luas, karena memerlukan *condenser* dan *cooling tower*. *Evaporative condenser* adalah alat gabungan dari *condenser* dan *cooling tower*. Pemakaian *evaporative condenser* saat ini memerlukan konsumsi air yang besar, dengan laju *makeup water* sebesar 1,5 ton/jam. Dalam penelitian ini, percobaan dilakukan dengan *generator* Diesel sebagai sumber panas, laju panasnya $\dot{Q}_M$ sekitar 12,6 kW dan panas spesifik q yang perlu dipindahkan sekitar 7,6 kJ/kg. Dalam pengaturan eksperimen ini, diusulkan pendinginan air pendingin mesin Diesel sebelum masuk *evaporative condenser*, dengan menggunakan sebuah *heat exchanger* pada pipa yang mengalirkan cairan tersebut. Media pendingin untuk *heat exchanger* adalah air. Eksperimen jenis pertama menggunakan air ledeng. Eksperimen jenis kedua menggunakan air yang dialirkan dari air kolam *evaporative condenser*. Kedua eksperimen ini menggunakan dua macam aliran air yaitu, *parallel flow* dan *counter flow*. Hasil penelitian menunjukkan bahwa secara umum, menggunakan *counter flow* memberikan hasil yang terbaik. Eksperimen tanpa *heat exchanger* memberikan laju penguapan sebesar 34 kg/jam. Eksperimen jenis pertama dengan konfigurasi *counter flow* pada *heat exchanger* memberikan penurunan pada laju penguapan air sebesar 60% (13,4 kg/jam) dibandingkan dengan pengoperasian normal, sedangkan jenis kedua dengan *counter flow* pada *heat exchanger* memberikan penurunan laju penguapan air sebesar 50% (17 kg/jam) dibandingkan dengan pengoperasian normal. Persentase laju penguapan air pendingin di pabrik adalah 1%, dan dari hasil eksperimen didapatkan 1,13%.

Kata Kunci : *Evaporative condenser*, *heat exchanger*, perpindahan panas.

Referensi : 13 (2001-2020)

ABSTRACT

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EFFORTS TO REDUCE THE EVAPORATION OF THE COOLING WATER IN AN EVAPORATIVE CONDENSER

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Cooling process is needed because of the heat produced by machine operation. Due to that, heat transfer tools such as coolers, condensers, heat exchangers are required. In the industry, cooling mediums that are commonly used are air, oil, and water. The cooling process happens inside a condenser. Currently, in the cooling process of an ice making factory, one of the methods to reduce the temperature of the cooling mediums is to use a cooling tower by transferring the heat to the environment. Cooling towers require a large area, this is because cooling towers must be paired with condensers. An evaporative condenser is a combination of a condenser and a cooling tower. Evaporative condensers today consume large amounts of water, with the rate of makeup water as big as 1.5 tons/hour. In this research, the experiment is done with a Diesel generator as a heat source, with a heat transfer rate $\dot{Q}_M$ of approximately 12.6 kW and the specific heat transfer rate q of approximately 7.6 kJ/kg. For the arrangement of the experiment, it is proposed that the hot cooling medium from the Diesel machine is cooled by adding a heat exchanger on the pipe carrying the cooling medium before it enters the evaporative condenser. The cooling medium used inside the heat exchanger is water. The first kind of experiment uses tap water, while the second kind of experiment uses the water from the water tank of the evaporative condenser. Both experiments use parallel flow and counter flow. The research results show that on average, using counter flow provides the best result. The experiment without using the heat exchanger gives the rate of evaporation of water of 34 kg/hour. The first kind of experiment with counter flow arrangement for the heat exchanger gives a reduction in the rate of evaporation of water of 60% (13.4 kg/hour) when compared with normal operation, while the second kind of experiment with counter flow arrangement for the heat exchanger gives a reduction in the rate of evaporation of water of 50% (17 kg/hour) when compared with normal operation. The percentage of the rate of evaporation of the cooling water in the factory is 1%, and from the results of the experiment, the percentage obtained was 1,13%.

Keywords : Evaporative condenser, heat exchanger, heat transfer.

References : 13 (2001-2020)