

ABSTRAK

DAWUD BAIHAQI KUMARA TSANI. ANALISIS EFEKTIVITAS *OIL COOLER* SEBELUM DAN SESUDAH PENGGANTIAN *HEAT EXCHANGER* PADA UNIT 2 PLTD TEGINENENG Dibimbing oleh Dr.,Drs. Prayudi, M.M., M.T

Penelitian ini bertujuan untuk menganalisis efektivitas termal *oil cooler* pada Unit 2 PLTD Tegineneng sebelum dan sesudah dilakukan penggantian komponen *Plate Heat Exchanger* (PHE). Penggantian ini merupakan upaya pemeliharaan korektif untuk mengatasi degradasi performa sistem pendingin akibat indikasi akumulasi *fouling* pada unit lama. Evaluasi termodinamika dilakukan pada kondisi beban operasional konstan 5 MW menggunakan pendekatan kuantitatif, yang mencakup validasi kesetimbangan panas (*heat balance*), analisis *Log Mean Temperature Difference* (LMTD), serta perhitungan laju perpindahan panas aktual (Q_{act}) dan maksimal (Q_{max}). Parameter tersebut kemudian digunakan untuk menentukan nilai efektivitas (ϵ) alat penukar panas berdasarkan data log temperatur *inlet* dan *outlet* pada sisi oli pelumas maupun air pendingin (*LT Water*). Hasil perhitungan menunjukkan peningkatan kinerja yang sangat signifikan pasca-penggantian komponen. Nilai efektivitas rata-rata meningkat dari 47,87% menjadi 68,41%, dengan titik efektivitas puncak mencapai 80,00%. Peningkatan ini berbanding lurus dengan kemampuan alat membuang beban termal hingga laju aktual 1.134 kW, serta penurunan nilai LMTD dari rentang 10,72°C–12,33°C menjadi 6,49°C–9,28°C, yang mengindikasikan proses pertukaran panas berlangsung jauh lebih efisien. Secara keseluruhan, penggantian *heat exchanger* terbukti memberikan pengaruh positif secara mutlak dalam mengoptimalkan temperatur oli dan menjamin keandalan operasi mesin PLTD.

Kata Kunci: *Oil Cooler, Plate Heat Exchanger, Log Mean Temperature Difference (LMTD), Laju Perpindahan Panas, Efektivitas Termal.*

ABSTRACT

Dawud Baihaqi Kumara Tsani. ANALYSIS OF OIL COOLER EFFECTIVENESS BEFORE AND AFTER HEAT EXCHANGER REPLACEMENT ON UNIT 2 PLTD TEGINENENG.

Supervised by Dr.,Drs. Prayudi, M.M., M.T

This study aims to analyze the thermal effectiveness of the oil cooler at Unit 2 of the Tegineneng Diesel Power Plant (PLTD) before and after the replacement of the Plate Heat Exchanger (PHE) component. This replacement is a corrective maintenance effort to overcome the performance degradation of the cooling system due to indications of fouling accumulation in the old unit. Thermodynamic evaluation was conducted under a constant operational load of 5 MW using a quantitative approach, which includes heat balance validation, Log Mean Temperature Difference (LMTD) analysis, and the calculation of actual (Q_{act}) and maximum (Q_{max}) heat transfer rates. These parameters were then used to determine the effectiveness value (ϵ) of the heat exchanger based on the inlet and outlet temperature log data on both the lubricating oil and cooling water (LT Water) sides. The calculation results show a highly significant performance improvement after the component replacement. The average effectiveness value increased from 47.87% to 68.41%, with a peak effectiveness reaching 80.00%. This increase is directly proportional to the equipment's ability to dissipate thermal loads up to an actual rate of 1,134 kW, as well as a decrease in the LMTD value from the range of 10.72°C–12.33°C to 6.49°C–9.28°C, indicating a much more efficient heat exchange process. Overall, the replacement of the heat exchanger is proven to have a positive impact in optimizing the oil temperature and ensuring the operational reliability of the power plant engine.

Keywords: Oil Cooler, Plate Heat Exchanger, Log Mean Temperature Difference (LMTD), Heat Transfer Rate, Thermal Effectiveness.