

**PENGARUH TEMPERATUR SEKITAR TERHADAP  
EFEKTIVITAS *CLOSED COOLING WATER COOLER FAN* PLTGU  
MUARA TAWAR UNIT GT 4.1 DENGAN BEBAN 100 DAN 125 MW**

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**ABSTRAK**

Penelitian ini bertujuan untuk menganalisis pengaruh temperatur sekitar ( $T_{ci}$ ) dan variasi beban terhadap efektivitas *Closed Cooling Water Cooler Fan* pada PLTGU Muara Tawar Unit GT 4.1. Data diperoleh melalui pengukuran langsung parameter operasi pada beban 100 MW dan 125 MW, meliputi temperatur fluida panas masuk, temperatur fluida panas keluar, dan temperatur sekitar. Analisis dilakukan menggunakan metode LMTD, NTU, dan koefisien perpindahan panas menyeluruh ( $U$ ) dengan bantuan Microsoft Excel, kemudian divalidasi melalui simulasi DWSIM. Hasil penelitian menunjukkan bahwa pada beban 100 MW, efektivitas tertinggi mencapai 84% pada temperatur sekitar  $31^{\circ}\text{C}$  dan menurun hingga  $\pm 82\%$  pada temperatur di atas  $33^{\circ}\text{C}$ . Pada beban 125 MW, efektivitas maksimum juga sebesar 84%, namun penurunannya lebih sensitif terhadap kenaikan temperatur sekitar dan berada pada kisaran 83% pada kondisi suhu tinggi. Hal ini menunjukkan bahwa kombinasi beban tinggi dan temperatur sekitar tinggi membatasi kemampuan sistem dalam mempertahankan perpindahan panas yang optimal. Nilai MAPE sebesar 5,49% menunjukkan tingkat akurasi sangat baik, sehingga hasil simulasi dinyatakan valid dan representatif terhadap kondisi aktual.

Kata kunci: *Closed cooling water cooler fan*, temperatur sekitar, variasi beban, efektivitas, MAPE

## ABSTRACT

This study aims to analyze the effect of ambient temperature ( $T_{ci}$ ) and load variation on the effectiveness of the Closed Cooling Water (CCW) Cooler Fan at PLTGU Muara Tawar Unit GT 4.1. The data were obtained through direct measurements of operating parameters under load conditions of 100 MW and 125 MW, including hot fluid inlet temperature, hot fluid outlet temperature, and ambient temperature. The analysis was carried out using the Log Mean Temperature Difference (LMTD), Number of Transfer Unit (NTU), and overall heat transfer coefficient ( $U$ ) methods with the assistance of Microsoft Excel, and subsequently validated through DWSIM simulation. The results indicate that at a load of 100 MW, the highest effectiveness reached 84% at an ambient temperature of approximately 31°C and decreased to around 82% at temperatures above 33°C. At a load of 125 MW, the maximum effectiveness was also 84%; however, the decline was more sensitive to increases in ambient temperature, reaching approximately 83% under higher temperature conditions. These findings demonstrate that the combination of high load and elevated ambient temperature limits the system's ability to maintain optimal heat transfer performance. The MAPE value of 5.49% indicates a very good level of accuracy, confirming that the simulation results are valid and representative of actual operating conditions.

**Keywords:** Closed Cooling Water, ambient temperature, load variation, effectiveness, MAPE.