

ABSTRAK

ANALISIS PENGARUH LAJU MASSA UAP TERHADAP EFISIENSI KINERJA TURBIN UAP PADA PEMBANGKIT LISTRIK TENAGA PANAS BUMI ULUBELU

Oleh

DEA FITRIANINGSIH

Telah dilakukan penelitian untuk menganalisis laju massa uap, tekanan, temperatur, laju uap masuk, fraksi uap, entalpi, daya turbin, kerja aktual turbin, daya *input* dan *output* turbin, serta efisiensi turbin. Penelitian ini bertujuan untuk menganalisis pengaruh laju massa uap terhadap efisiensi turbin, menentukan hubungan antara laju massa uap dan efisiensi turbin, dan memberikan rekomendasi terkait pengoperasian turbin uap yang optimal dalam hal laju massa uap untuk meningkatkan efisiensi turbin. Hasil perhitungan laju aliran massa uap berkisar antara 80,0 kg/s hingga 86,9 kg/s. Nilai fraksi kekeringan (x) berkisar antara 83,01% hingga 83,74%, yang menunjukkan kualitas uap masih dalam rentang efisien untuk menghindari kerusakan turbin akibat uap basah. Entalpi masuk ke turbin (h_1) stabil di kisaran 2755–2758 kJ/kg, sedangkan entalpi keluar (h_{2s}) menunjukkan nilai antara 2180–2216 kJ/kg, yang berpengaruh langsung terhadap kerja turbin (W), dihitung sebagai selisih antara h_1 dan h_2 dengan dikalikan laju aliran massa. Nilai efisiensi turbin berada pada kisaran 93,13% hingga 94,17%, dengan rata-rata sebesar 93,32%, yang termasuk tinggi untuk sistem pembangkit uap. Selisih nilai antara kerja aktual dan kerja *isentropis* kecil, sehingga diperoleh efisiensi turbin yang mendekati 100%, yang berarti sistem turbin mendekati desain atau proses ideal.

Kata kunci : Efisiensi turbin, laju massa uap.

ABSTRACT

ANALYSIS OF THE EFFECT OF STEAM MASS RATE ON STEAM TURBINE PERFORMANCE EFFICIENCY IN ULUBELU GEOTHERMAL POWER PLANT

By

DEA FITRIANINGSIH

A study has been conducted to analyze the steam mass rate, pressure, temperature, steam inlet rate, steam fraction, enthalpy, turbine power, actual turbine work, turbine input and output power, and turbine efficiency. This study aims to analyze the effect of steam mass rate on turbine efficiency, determine the relationship between steam mass rate and turbine efficiency, and provide recommendations regarding optimal steam turbine operation in terms of steam mass rate to increase turbine efficiency. The results of the steam mass flow rate calculation range from 80.0 kg/s to 86.9 kg/s. The dryness fraction value (x) ranges from 83.01% to 83.74%, which indicates that the steam quality is still in the efficient range to avoid turbine damage due to wet steam. The turbine inlet enthalpy (h_1) is stable in the range of 2755–2758 kJ/kg, while the outlet enthalpy (h_2) shows a value between 2180–2216 kJ/kg, which directly affects the turbine work (W), calculated as the difference between h_1 and h_2 multiplied by the mass flow rate. The turbine efficiency value is in the range of 93.13% to 94.17%, with an average of 93.32%, which is high for a steam generator system. The difference in value between actual work and isentropic work is small, so that the turbine efficiency is close to 100%, which means that the turbine system is close to the ideal design or process.

Keywords: *Efficiency, steam mass rate.*