

**ANALISIS EFISIENSI TERMAL SEBELUM DAN SESUDAH *OVERHAUL*
TURBIN INSPECTION DI PLTGU BLOK 3 UNIT 2 PT PLN NUSANTARA
POWER UP GRESIK**

Muhammad Naufal Hardiansyah

Dibawah bimbingan Bapak Muhammad Ridwan, S.T. M.T.

Program Studi Teknik Mesin Institut Teknologi PLN Jakarta

Telepon: 085231061430

Email: muhammad2212011@itpln.ac.id

ABSTRAK

Penelitian ini menganalisis efisiensi termal Pembangkit Listrik Tenaga Gas dan Uap (PLTGU) PT PLN Nusantara Power Unit Pembangkitan Gresik pada Gas Turbine GT 3.2 PLTGU Blok 3 Unit 2, dengan membandingkan kondisi sebelum dan sesudah overhaul (*Turbine Inspection*). Penelitian didorong oleh peningkatan kebutuhan listrik serta penurunan kinerja turbin gas akibat jam operasi seperti fouling dan keausan yang berpotensi menaikkan konsumsi bahan bakar. Efisiensi termal dijadikan indikator utama kinerja pembangkit, berlandaskan teori siklus Brayton, yakni perbandingan kerja bersih turbin terhadap kalor masuk (Q_{in}). Metode yang digunakan adalah studi lapangan dengan pendekatan komparatif sebelum–sesudah, memanfaatkan data operasi aktual yang kemudian diolah melalui perhitungan berbantuan Microsoft Excel. Parameter yang dianalisis mencakup temperatur, tekanan, nilai kalor bawah (LHV), laju aliran bahan bakar, serta variabel pendukung lain pada beban 100 MW dan 103 MW. Hasil menunjukkan adanya peningkatan efisiensi termal pasca overhaul: pada beban 100 MW naik dari 30,5450% menjadi 31,4085%, dan pada beban 103 MW meningkat dari 30,7662% menjadi 31,4256%. Selain itu, daya keluaran turbin bertambah 4,7 MW atau 4,55%. Kesimpulannya, overhaul efektif meningkatkan performa output dan cenderung memperbaiki efisiensi termal, meskipun dipengaruhi kondisi operasi saat pengambilan data di lapangan.

Kata kunci: Efisiensi Termal, PLTGU, *Turbine Inspection*, Overhaul, Turbin Gas

THERMAL EFFICIENCY ANALYSIS BEFORE AND AFTER *TURBINE INSPECTION* OVERHAUL AT PLTGU BLOCK 3 UNIT 2 PT PLN NUSANTARA POWER UP GRESIK

Muhammad Naufal Hardiansyah, 202212011

Under the Guidance of Muhammad Ridwan, S.T., M.T.

Mechanical Engineering Study Program, PLN Jakarta Institute of Technology

Telephone: 085231061430

Email: muhammad2212011@itpln.ac.id

ABSTRACT

This study aims to analyze the thermal efficiency of a Combined Cycle Power Plant (PLTGU) at PT PLN Nusantara Power, Gresik Generation Unit, specifically Gas Turbine GT 3.2 in Block 3 Unit 2, by comparing performance before and after an overhaul (Turbine Inspection). The research is motivated by the increasing electricity demand and the degradation of gas turbine component performance due to operating hours, such as fouling and wear, which can lead to higher fuel consumption. Thermal efficiency is used as a key performance indicator based on the Brayton cycle theory, defined as the ratio of net work output to heat input (Q_{in}). This study employs a field research method with a comparative before–after approach, using actual operational data processed through calculations assisted by Microsoft Excel. The analyzed parameters include temperature, pressure, lower heating value (LHV), fuel flow rate, and other supporting operational variables at loads of 100 MW and 103 MW. The results show an improvement in thermal efficiency after the overhaul. At 100 MW, thermal efficiency increased from 30.5450% to 31.4085%, while at 103 MW it rose from 30.7662% to 31.4256%. In addition, turbine output power increased by 4.7 MW or 4.55% after the overhaul. Overall, the study concludes that the overhaul/Turbine Inspection effectively enhances output performance and tends to improve thermal efficiency, although it remains influenced by actual operating conditions during data collection.

Keywords: *Thermal Efficiency, PLTGU, Turbine Inspection, Overhaul, Gas Turbine*