Analysis of Turbine Heat Rate by Reviewing Variations in Loading Performed on PLTU Unit 6 PT YTL East Java

Supervisor: Prof. Dr. Ir. Bayu Rudiyanto, S.T., M.Si

Erlangga Riski Ramadani
Study Program Renewable Energy Engineering
Majoring of Engineering

ABSTRACT

The continuously increasing demand for electrical energy, in line with population and industrial growth, requires power generation systems that are efficient and reliable. One of the primary performance indicators of a coal-fired power plant (PLTU) is the turbine heat rate, which represents the amount of thermal energy required to produce one unit of electrical energy. This study aims to analyze the values of gross and nett turbine heat rate as well as turbine efficiency at Unit 6 of PT YTL East Java based on load variations, and to compare them with the performance test results during commissioning. The methods applied include literature review, field observations, operational parameter data collection through the Distributed Control System (DCS), and enthalpy calculations using the Engineering Equation Solver (EES) software. The results show that the gross and nett turbine heat rate values under the latest operational condition as of July 23, 2024, decreased along with increasing load. The lowest gross turbine heat rate value of 8,169.18 kJ/kWh was achieved at a 500 MW load, while the highest turbine efficiency of 44.068% occurred at the same load. Compared to the commissioning data in 2000, the latest turbine heat rate values are higher across the entire load range, attributed to performance degradation of the turbine components after more than two decades of operation. This analysis concludes that the 500 MW load is the optimum operating point for Unit 6 of PT YTL East Java in terms of fuel consumption efficiency and turbine performance.

Keywords: *EES, turbine efficiency, coal-fired power plant, turbine heat rate, load variatio*