

ABSTRAK

PENGARUH PEMELIHARAAN *TURBOCHARGER* TERHADAP KEANDALAN MESIN PEMBANGKIT PLTD UNIT 1 PLTD TUA PEJAT ULP MENTAWAI

Niko Rahmayana, 202372545

Dibimbing oleh : Muhamad Ridwan,S.T,M.T.

PLTD Tua Pejat adalah pemasok utama listrik di Kepulauan Mentawai. Unit 1 mesin MTU G63 mengalami gangguan *turbocharger* berulang akibat pemeliharaan reaktif dan lingkungan pesisir korosif. Penelitian ini bertujuan mengevaluasi pemeliharaan *turbocharger* Unit 1, mengidentifikasi penyebab kegagalan, menganalisis pengaruhnya terhadap keandalan mesin, dan merancang strategi pemeliharaan berbasis kondisi.

Metode menggunakan *Root Cause Failure Analysis (RCFA)* dengan diagram *fishbone* dan FMEA. Data diperoleh dari observasi, wawancara, dan data historis gangguan Januari-September 2025.

Hasilnya, pemeliharaan masih reaktif. Akar penyebab utama: metode reaktif, material (BBM sulfur 3.500 ppm), lingkungan (kadar garam 0,15 mg/m³), dan tanpa monitoring. Prioritas kegagalan tertinggi: ketidakseimbangan rotor (RPN 512) dan kerak karbon (RPN 504).

Parameter keandalan eksisting: MTBF 6.496 jam, MTTR 56 jam, *Availability* 99,15% (pola *wear out*). Strategi yang dirancang mencakup perawatan level P0-P6, *predictive* monitoring, serta modifikasi *marine* filter dan *coating* anti-korosi.

Simulasi menunjukkan peningkatan MTBF menjadi 8.500 jam, MTTR turun 20 jam, dan *Availability* 99,77%. Ada pengaruh signifikan antara kualitas pemeliharaan *turbocharger* terhadap keandalan mesin Unit 1.

Kata Kunci: *Turbocharger*, Pemeliharaan, Keandalan, MTU G63, RCFA, FMEA, PLTD, Mentawai

ABSTRACT
**THE INFLUENCE OF TURBOCHARGER MAINTENANCE ON THE
RELIABILITY OF PLTD GENERATOR UNIT 1 PLTD TUA PEJAT ULP MENTAWAI**

Niko Rahmayana, 202372545

Supervised by: **Muhamad Ridwan, S.T, M.T.**

Tua Pejat Diesel Power Plant is the main electricity supplier in the Mentawai Islands. Unit 1 with MTU G63 engine experiences recurring turbocharger failures due to reactive maintenance and corrosive coastal environment. This study aims to evaluate turbocharger maintenance on Unit 1, identify failure factors, analyze its effect on engine reliability, and design an appropriate condition-based maintenance strategy.

The method uses Root Cause Failure Analysis (RCFA) integrating fishbone diagram and FMEA. Data were collected through observation, interviews, and historical disturbance data from January to September 2025 focused on Unit 1.

Results show that maintenance remains reactive. Main root causes: method (reactive maintenance), material (low fuel quality with 3,500 ppm sulfur), environment (sea air with 0.15 mg/m³ salt content), and measurement (no condition monitoring). FMEA analysis indicates highest priority failure modes: rotor imbalance due to carbon deposits (RPN 512) and carbon deposits on turbine (RPN 504).

Existing reliability parameters for Unit 1: MTBF 6,496 hours, MTTR 56 hours, and Availability 99.15% with wear out failure pattern confirmed by Weibull analysis. The designed condition-based maintenance strategy integrates P0-P6 maintenance levels, predictive programs (vibration, thermal, oil analysis), and technical modifications including marine grade air filters and anti-corrosion coating.

Simulation projects that this strategy will increase MTBF to 8,500 hours, reduce MTTR to 20 hours, and increase Availability to 99.77%. There is a significant influence between turbocharger maintenance quality and Unit 1 engine reliability.

Keywords: Turbocharger, Maintenance, Reliability, MTU G63, RCFA, FMEA, Diesel Power Plant, Mentawai