

ABSTRAK

Dwi Murdani. Analisis Life Cycle Cost (LCC) Mesin Diesel Pada PLTD Tenau Kupang untuk Evaluasi Efisiensi Biaya dan Manajemen Operasional. Dibimbing Dr. Ir. Edy Susanto, ST., MT., IPM

Pembangkit Listrik Tenaga Diesel (PLTD) masih menjadi tulang punggung penyediaan energi listrik di wilayah kepulauan Indonesia, termasuk PLTD Tenau Kupang di Provinsi Nusa Tenggara Timur. Tingginya konsumsi bahan bakar, frekuensi pemeliharaan, dan kegiatan overhaul menyebabkan biaya operasional pembangkit relatif besar sehingga diperlukan evaluasi ekonomi berbasis data aktual. Penelitian ini bertujuan menganalisis Life Cycle Cost (LCC) mesin diesel sebagai dasar evaluasi efisiensi biaya operasional. Metode yang digunakan adalah analisis LCC dengan pendekatan deskriptif kuantitatif berdasarkan data jam operasi, konsumsi bahan bakar, produksi energi listrik, specific fuel consumption (SFC), biaya pemeliharaan, dan biaya overhaul periode 2020–2025. Seluruh komponen biaya dikonversi ke nilai sekarang menggunakan metode present cost dengan tingkat diskonto 8%. Hasil analisis menunjukkan bahwa biaya bahan bakar merupakan komponen dominan dalam struktur LCC dan dipengaruhi langsung oleh nilai SFC serta pola beban operasi mesin. Analisis sensitivitas memperlihatkan bahwa perubahan harga bahan bakar dan efisiensi mesin memberikan dampak paling signifikan terhadap total LCC dibandingkan parameter lainnya. Dengan demikian, pengendalian konsumsi bahan bakar melalui optimasi beban dan manajemen pemeliharaan menjadi faktor kunci dalam menurunkan biaya siklus hidup mesin diesel.

Kata kunci: Cycle Cost, PLTD, mesin diesel, efisiensi operasional, biaya bahan bakar.

ABSTRACT

Dwi Murdani. Life Cycle Cost (LCC) Analysis of Diesel Engines at the Tenau Kupang Diesel Power Plant to Evaluate Cost Efficiency And Operational Management.
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Diesel Power Plants (PLTD) remain the primary source of electricity supply in Indonesia's archipelagic regions, including the Tenau Kupang Diesel Power Plant in East Nusa Tenggara Province. High fuel consumption, frequent maintenance activities, and periodic overhaul requirements contribute significantly to operational costs, necessitating a comprehensive economic evaluation based on actual operational data. This study aims to analyze the Life Cycle Cost (LCC) of diesel engines as a basis for evaluating operational cost efficiency. The research employs a quantitative descriptive approach using LCC analysis based on operational data from 2020–2025, including engine operating hours, fuel consumption, electricity production, specific fuel consumption (SFC), maintenance costs, and overhaul costs. All cost components were converted into present value using the present cost method with an 8% discount rate. The results indicate that fuel cost is the dominant component in the LCC structure and is directly influenced by SFC values and engine loading patterns. Sensitivity analysis shows that changes in fuel prices and engine efficiency have the most significant impact on total LCC compared to other parameters. Therefore, controlling fuel consumption through load optimization and effective maintenance management is essential to reducing the life cycle cost of diesel engines.

Keywords: Life Cycle Cost, diesel power plant, diesel engine, operational efficiency, fuel cost.