

ABSTRAK

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Judul Tesis : Pengaruh Pemasangan *Onshore Power Supply* (OPS) Terhadap Penurunan Biaya Bahan Bakar Dan Emisi CO₂ Pada Kapal Pengangkut Batu Bara (Studi Kasus KM Adhiguna Tarahan di PLTU Suralaya)

Penggunaan *Auxiliary Engine* berbahan bakar fosil pada kapal yang sedang sandar di pelabuhan masih menjadi sumber utama konsumsi bahan bakar dan emisi karbon di sektor maritim. Penelitian ini bertujuan untuk menganalisis kelayakan teknis, ekonomis, dan lingkungan dari penerapan sistem *Onshore Power Supply* (OPS) sebagai pengganti *Auxiliary Engine* pada KM Adhiguna Tarahan selama kegiatan pembongkaran di pelabuhan. Penelitian ini menggunakan pendekatan kuantitatif dengan metode studi kasus, melalui analisis komparatif kondisi sebelum dan sesudah penerapan OPS. Analisis kelayakan ekonomi dilakukan menggunakan indikator *Net Present Value* (NPV), *Internal Rate of Return* (IRR), dan *Payback Period* (PP), sedangkan analisis lingkungan dilakukan melalui perhitungan intensitas emisi CO₂ berbasis konsumsi energi. Hasil penelitian menunjukkan bahwa sebelum penerapan OPS, intensitas emisi mencapai 0,29 t CO₂/jam sandar, yang sepenuhnya berasal dari konsumsi bahan bakar *Auxiliary Engine*. Setelah penerapan OPS, intensitas emisi menurun menjadi 0,14 t CO₂/jam sandar, atau mengalami penurunan sebesar ±52 %. Secara tahunan, total emisi CO₂ berkurang dari 525,9 t CO₂ menjadi 246,5 t CO₂. Dari sisi ekonomi, biaya operasional sebelum penerapan OPS berada pada kisaran Rp 60 juta hingga Rp 235 juta per periode sandar, sedangkan setelah penerapan OPS menurun signifikan menjadi sekitar Rp 1,7 juta hingga Rp 38 juta. Penghematan biaya yang diperoleh berkisar antara Rp 31 juta hingga Rp 338 juta per periode, dengan rata-rata penghematan lebih dari Rp 80 juta. Hasil ini menunjukkan bahwa penerapan OPS tidak hanya efektif dalam menurunkan emisi karbon, tetapi juga layak secara ekonomi dan mendukung konsep *green port* serta strategi dekarbonisasi sektor maritim nasional.

Kata kunci: *Onshore Power Supply*, kelayakan ekonomi, emisi CO₂, *auxiliary engine*, *green port*.

ABSTRACT

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Thesis Title : The Impact of Onshore Power Supply (OPS) Installation on Reducing Fuel Costs and CO₂ Emissions in Coal Carrier Vessels (Case Study of KM Adhiguna Tarahan at Suralaya Steam Power Plant)

The use of fossil fuel-based auxiliary engines during berthing operations remains a major contributor to fuel consumption and carbon emissions in the maritime sector. This study aims to evaluate the technical, economic, and environmental feasibility of implementing an Onshore Power Supply (OPS) system as a substitute for auxiliary engines on KM Adhiguna Tarahan during cargo unloading activities at the port. A quantitative case study approach was employed using comparative analysis between operational conditions before and after OPS implementation. The economic feasibility was assessed using Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP), while environmental analysis was conducted through CO₂ emission intensity calculations based on energy consumption. The results indicate that prior to OPS implementation, emission intensity reached 0.29 t of CO₂/hour of berthing, entirely generated by auxiliary engine fuel consumption. Following OPS implementation, emission intensity decreased to 0.14 t of CO₂/hour, representing an approximate reduction of 52 %. On an annual basis, total CO₂ emissions were reduced from 525.9 t CO₂ to 246.5 t CO₂. From an economic perspective, operational costs before OPS implementation ranged from IDR 60 million to IDR 235 million per berthing period. After OPS adoption, costs significantly decreased to approximately IDR 1.7 million to IDR 38 million. The resulting cost savings ranged from IDR 31 million to IDR 338 million per period, with an average saving exceeding IDR 80 million. These findings demonstrate that OPS implementation is not only effective in reducing carbon emissions but also economically viable, supporting the development of green port initiatives and maritime sector decarbonization strategies.

Keywords: *Onshore Power Supply, economic feasibility, CO₂ emissions, auxiliary engine, green port.*