

## **ANALISIS EKONOMI TEKNIK: INVESTASI INSINERATOR KOGENERASI LIMBAH MEDIS BERKAPASITAS 150KG/JAM**

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### **INTISARI**

Pengelolaan limbah medis di Indonesia menghadapi tantangan kapasitas, sementara insinerator konvensional hanya berfungsi sebagai unit destruksi tanpa memanfaatkan energi termal *flue gas*. Penelitian ini menganalisis kelayakan investasi insinerator kogenerasi limbah medis berkapasitas 150 kg/jam menggunakan parameter ekonomi teknik meliputi Net Present Value (NPV), Annual Equivalent (AE), Benefit Cost Ratio (BCR), dan Payback Period (PP) pada dua skenario operasional.

Metode penelitian menggunakan pendekatan siklus termodinamika terbuka untuk menghitung efisiensi termal dan analisis ekonomi teknik berbasis data teknis perancangan dan harga pasar. Skenario pertama mengakomodasi kebutuhan rumah sakit 200 tempat tidur, sedangkan skenario kedua memaksimalkan produksi uap hingga kapasitas 1.335 tempat tidur.

Hasil penelitian menunjukkan kapasitas sistem produksi uap 1.417,32 kg/jam. Pada skenario 200 tempat tidur, proyek menghasilkan NPV Rp 26,6 miliar, AE Rp 3,50 miliar, BCR 2,27, dan PP 1,82 tahun. Skenario penjualan *steam* maksimal menunjukkan NPV Rp 31,5 miliar, AE Rp 4,15 miliar, BCR 2,50, dan PP 1,54 tahun. Hasil analisis memberikan gambaran potensial insinerator kogenerasi limbah medis sebagai solusi pengolahan limbah medis yang efisien dan menguntungkan melalui implementasi *waste-to-energy*.

**Kata kunci:** *Insinerator Kogenerasi, Limbah Medis, Analisis Ekonomi Teknik, Kelayakan Investasi.*

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**ENGINEERING ECONOMIC ANALYSIS: INVESTMENT IN A  
MEDICAL WASTE COGENERATION INCINERATOR  
WITH A CAPACITY OF 150 KG/H**

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**ABSTRACT**

Medical waste management in Indonesia faces limited treatment capacity, while conventional incinerators only function as destruction units without utilizing thermal energy from flue gas. This study analyzes the investment feasibility of a cogeneration medical waste incinerator with 150 kg/hour capacity using engineering economic parameters including Net Present Value (NPV), Annual Equivalent (AE), Benefit Cost Ratio (BCR), and Payback Period (PP) across two operational scenarios.

The research method employs an open thermodynamic cycle approach to calculate thermal efficiency combined with engineering economic analysis based on technical design data and market prices. The first scenario accommodates a 200-bed hospital's steam demand, while the second scenario maximizes steam production capacity to serve up to 1,335 beds.

The result shows the system's production limit of 1,417.32 kg/hour. In the 200-bed hospital scenario, the project yields NPV of Rp 26.6 billion, AE of Rp 3.50 billion, BCR of 2.27, and PP of 1.82 years. The maximum steam sales scenario demonstrates superior performance with NPV of Rp 31.5 billion, AE of Rp 4.15 billion, BCR of 2.50, and PP of 1.54 years. Analysis result tells a representation of the medical waste cogeneration incinerator's potential to be an efficient and profitable medical waste management solution through waste-to-energy implementation.

**Keywords:** *Cogeneration Incinerator, Medical Waste, Energy Efficiency, Engineering Economic Analysis.*

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