

**ANALISIS PENGARUH MODE PENGOPERASIAN
ARUS *RECTIFIER ELECTROSTATIC PRECIPITATOR* (ESP)
TERHADAP EFISIENSI *HOUSE LOAD*
DI PT. POMI UNIT 8 PLTU PAITON**

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ABSTRAK

Manajemen energi merupakan pendekatan sistematis yang bertujuan untuk memanfaatkan energi secara efektif, efisien, dan rasional tanpa mengorbankan kualitas maupun kuantitas. Pada perusahaan pembangkit listrik tenaga uap (PLTU), efisiensi energi menjadi aspek penting seiring dengan meningkatnya kebutuhan akan energi listrik, yang turut mempengaruhi peningkatan konsumsi energi internal atau *house load*. Salah satu upaya efisiensi energi di PT. POMI Unit 8 PLTU Paiton adalah dengan mengatur mode pengoperasian *Electrostatic Precipitator* (ESP), sebuah alat penangkap partikulat/abu dari hasil pembakaran batu bara yang memanfaatkan arus DC tegangan tinggi melalui *rectifier transformer*. Berdasarkan Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor P.15/MENLHK/SETJEN/KUM.1/4/2019, batas maksimum emisi partikulat/abu untuk PLTU adalah 100 mg/Nm³, sedangkan hasil pengukuran emisi di PT. POMI Unit 8 berada jauh di bawah batas tersebut, yaitu rata-rata <20 mg/Nm³ dengan 16 *transformer/rectifier* ESP beroperasi. Metode penelitian dilakukan dengan membandingkan beberapa mode pengoperasian *arus rectifier* ESP terhadap efisiensi pengendapan partikulat/abu, konsumsi daya listrik, serta deviasi antara efisiensi teoritis dan hasil uji kinerja lapangan. Hasil penelitian menunjukkan. Mode pengoperasian dengan arus tinggi menghasilkan efisiensi ESP tertinggi hingga 99,96%, namun diikuti oleh konsumsi daya yang lebih besar. Berdasarkan penelitian Mode 2 direkomendasikan sebagai mode pengoperasian paling optimal karena mampu menjaga keseimbangan antara kinerja ESP dan efisiensi energi, dengan efisiensi sebesar 99,72%, emisi partikulat/abu 35 mg/Nm³, konsumsi daya *house load* berkurang 171 kwh atau 0,57% dari normal operasi, sehingga beban *house load* berkurang menjadi 1,92% atau menghemat senilai 123.768 kwh/bulan atau senilai Rp. 123.464.516/ bulan. Dengan demikian, pengaturan mode 2 pengoperasian *arus rectifier* ESP yang tepat dapat menjadi strategi efektif dalam meningkatkan efisiensi *house load* PLTU tanpa mengorbankan kepatuhan batu mutu emisi PLTU terhadap standar lingkungan yang berlaku.

Kata Kunci: Manajemen Energi, Efisiensi *House load*, *Electrostatic Precipitator*, *Arus Rectifier*, Baku Mutu Emisi PLTU

**ANALYSIS OF THE IMPACT OF *ELECTROSTATIC
PRECIPITATOR (ESP) RECTIFIER CURRENT MODE*
ON *HOUSE LOAD EFFICIENCY*
AT PT. POMI UNIT 8 PLTU PAITON**

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ABSTRACT

Energy management is a systematic approach aimed at utilizing energy effectively, efficiently, and rationally without compromising quality or quantity. In steam power plants (PLTU), energy efficiency has become a critical aspect in line with the increasing demand for electrical energy, which directly affects the rise in internal energy consumption or house load. One of the energy efficiency efforts implemented at PT. POMI Unit 8 PLTU Paiton is the optimization of the operating mode of the Electrostatic Precipitator (ESP), a particulate collection device used to capture coal combustion by-products by utilizing high-voltage direct current supplied through rectifier transformers. Based on the Regulation of the Minister of Environment and Forestry Number P.15/MENLHK/SETJEN/KUM.1/4/2019, the maximum allowable particulate emission limit for coal-fired power plants is 100 mg/Nm³. Meanwhile, emission measurements at PT. POMI Unit 8 are significantly below this limit, averaging less than 20 mg/Nm³ with 16 ESP transformer/rectifier units in operation. The research method was conducted by comparing several ESP rectifier current operating modes in terms of particulate collection efficiency, electrical power consumption, and the deviation between theoretical efficiency and field performance test results. The results indicate that higher rectifier current operating modes produce the highest ESP efficiency, reaching up to 99.96%, but are accompanied by higher power consumption. Based on the analysis, Mode 2 is recommended as the most optimal operating mode because it is able to maintain a balance between ESP performance and energy efficiency, achieving an efficiency of 99.72%, particulate/ash emissions of 35 mg/Nm³, and a reduction in house load power consumption of 171 kWh or 0.57% compared to normal operation. As a result, the house load ratio is reduced to 1.92%, corresponding to energy savings of 123,768 kWh per month or approximately IDR 123,464,516 per month. Thus, the proper application of Mode 2 in ESP rectifier current operation can serve as an effective strategy to improve the house load efficiency of coal-fired power plants without compromising compliance with applicable environmental emission standards.

Key Words: *Energy Management, House load Efficiency, Electrostatic Precipitator (ESP), Rectifier Current Mode, Emission Standards for PLTU*