# ABSTRAK

ARIF RIZKI NUR ROEHMAN. Analisis Pengaruh Perubahan Jenis Batubara Terhadap Efisiensi Boiler di PLTU Ombilin. Dibimbing oleh Ir. Roswati Nurhasanah, S.T., M.T

Perubahan jenis batubara (*coal switching*) dari *High Rank Coal* (HRC) ke *Medium Rank Coal* (MRC) serta penerapan *co-firing* biomassa merupakan strategi operasional yang dapat mempengaruhi kinerja termal boiler. Penelitian ini bertujuan untuk menganalisis pengaruh *coal switching* terhadap efisiensi boiler PLTU Ombilin Unit 1 pada kondisi penggunaan HRC, MRC-1, dan MRC-2. Evaluasi dilakukan menggunakan metode langsung (*direct method*) dan metode tidak langsung (*indirect method*) berdasarkan standar ASME PTC 4-1, dengan metode tidak langsung digunakan untuk menganalisis distribusi kehilangan panas ($L_1$–$L_8$). Efisiensi boiler pada penggunaan HRC tercatat sebesar 92,69%, sedangkan pada MRC-1 dan MRC-2 masing-masing sebesar 83,37% dan 80,96%. Pada kondisi *co-firing* biomassa, efisiensi boiler cenderung mengalami penurunan lebih lanjut dibandingkan penggunaan batubara murni. Penurunan efisiensi tersebut berkorelasi dengan meningkatnya kehilangan panas, terutama pada komponen gas buang kering ($L_1$), uap air hasil pembakaran hidrogen ($L_2$), dan *moisture* bahan bakar ($L_3$). Peningkatan ini dipengaruhi oleh tingginya kandungan *moisture* dan hidrogen pada bahan bakar serta meningkatnya *excess air* selama proses pembakaran.

Dengan demikian, karakteristik bahan bakar memiliki pengaruh langsung terhadap distribusi energi dalam boiler, sehingga diperlukan optimasi parameter pembakaran untuk meminimalkan kehilangan panas dan menjaga efisiensi boiler tetap optimal.

**Kata kunci:** *coal switching*, efisiensi boiler, *indirect method, heat loss*.

# *ABSTRACT*

ARIF RIZKI NUR ROEHMAN. *Analysis of the Effect of Coal Type Switching on Boiler Efficiency at Ombilin Coal-Fired Power Plant. Supervised by* Ir. Roswati Nurhasanah, S.T., M.T

*Coal switching from High Rank Coal (HRC) to Medium Rank Coal (MRC), along with the implementation of biomass co-firing, is an operational strategy that can significantly affect boiler thermal performance. This study aims to evaluate the impact of coal switching and co-firing on the efficiency of the boiler at PLTU Ombilin Unit 1 under HRC, MRC-1, and MRC-2 operating conditions. The evaluation was conducted using both the direct method and the indirect method based on the ASME PTC 4-1 standard, with the indirect method applied to assess heat loss components ($L_1$–$L_8$). The results indicate that boiler efficiency under HRC operation reached 92.69%, while efficiencies decreased to 83.37% and 80.96% for MRC-1 and MRC-2, respectively. Under biomass co-firing conditions, the efficiency showed a further decline compared to coal-only operation. This reduction is associated with increased heat losses, particularly dry flue gas loss ($L_1$), hydrogen-related moisture loss ($L_2$), and fuel moisture loss ($L_3$). These losses are primarily influenced by higher moisture and hydrogen content in the fuel, as well as increased excess air during combustion.*

*These findings highlight the strong influence of fuel characteristics on energy distribution within the boiler, emphasizing the need for optimized combustion control to minimize heat losses and maintain efficient boiler performance.*

.

***Keywords:*** *coal switching, boiler efficiency, indirect method, heat loss.*