

## INTISARI

*Boiler* merupakan alat yang penting dalam pembangkitan energi listrik di PLTU. Didalam *boiler* terjadi proses pengubahan fasa fluida. *Feed water* akan diubah menjadi *superheated steam* didalam *boiler*. Dalam proses pengubahan fasa fluida, terjadi beberapa kerugian yang dialami *boiler*. Nilai dan jenis- jenis kerugian amatlah penting diketahui karena mempengaruhi efisiensi dari *boiler*.

Penelitian dilakukan dengan membandingkan perhitungan efisiensi menggunakan *direct* dan *indirect method*. *Direct method* adalah metode perhitungan efisiensi dengan membandingkan *input* (laju aliran batubara) dan *output* (laju aliran *steam*), sedangkan *indirect method* adalah metode perhitungan efisiensi dengan menghitung seluruh kerugian yang terjadi pada *boiler*. Perhitungan dilakukan pada dua kondisi untuk setiap metode, yaitu kondisi komisioning dan performa. Kedua kondisi dilakukan dengan beban penuh pada *boiler* (600 MW).

Hasil dari penelitian menunjukkan nilai efisiensi menggunakan *direct method* pada kondisi komisioning sebesar 58,65% sedangkan pada kondisi performa sebesar 88,14%. Terjadi peningkatan efisiensi sebesar 29,49%. Jika perhitungan menggunakan *indirect method*, efisiensi pada kondisi komisioning sebesar 86,46% sedangkan pada kondisi performa sebesar 84,66%. Terjadi penurunan efisiensi sebesar 1,8%. Perbedaan hasil perhitungan dikarenakan *direct method* menganggap nilai efisiensi berbanding terbalik dengan GCV batubara sedangkan pada *indirect method* berlaku sebaliknya. Pada perhitungan menggunakan *indirect method*, kerugian kalor akibat *flue gas* kering merupakan faktor kerugian panas terbesar yang dialami *boiler*. Untuk kondisi komisioning sebesar 5,69% sedangkan kondisi performa sebesar 6,29%. Penggunaan batubara dengan GCV (*Gross Calorific Value*) yang berbeda menyebabkan hasil perhitungan efisiensi dengan *indirect method* antara kondisi komisioning dan performa berbeda. Batubara dengan GCV rendah memiliki kadar kelembaban yang tinggi, sehingga kerugian kalor karena kelembaban bahan bakar meningkat. Selain itu SCAH (*steam coil air heater*) yang tidak berfungsi dengan baik membuat udara pembakaran pada kondisi performa lebih rendah dari kondisi komisioning.

## **ABSTRACT**

*Boiler is an important equipment to generate electricity in a steam power plant. The converting fluid phase process happened in boiler. Feed water will converted into superheated steam. On converting fluid phase process, there are some energy (heat) losses that happened in boiler. Value and kind of losses are important being calculation because influencing efficiency of boiler.*

*The efficiency calculation into using direct and indirect method was done. Direct method was efficiency calculation method input (flow of coal) and output (flow of steam), while indirect method is efficiency calculation all losses that was happened in the boiler. Calculation was done on two conditions for each method, they were comissioning and performance conditions. Both conditions using full load on boiler (600 MW) were done.*

*The result shown the value of efficiency used direct method on comissioning condition was 58.65% while on performance condition was 88.14%. There was increment with amount 29.14%. The calculation used indirect method, efficiency on comissioning condition was 86.46% while on performance condition was 84.66. There was derivation with amount 1.8%. Different result of calculation is caused direct method consider the value of efficiency inversely proportional with GCV of coal while on indirect method occurs the other way. The calculation used indirect method, heat loss caused by dry flue gas is the biggest lost that happened on the boiler. The comissioning condition was 5.69% while on performance was 6.29. Using coal with differ of GCV (Gross Calorific Value) caused differ of efficiency calculation result. Coal with low GCV had high moisture content. So the heat loss caused from moisture of fuel increased. Beside that SCAH (steam coil air heater) which was not well function made air combustion on performance condition lower than comissioning condition.*

*Keywords: Efficiency*