

Technical/Services

Technical service and assistance is fast becoming more important and increased emphasis is being placed on environmental issues. Pretorius Energy utilises the services of various technical specialist who can provide the following services:

- Regular technical visits to Pretorius Energy customers
- Assistance with coal quality queries and general combustion problems
- Boiler settings, efficiency testing and operational procedures
- Sampling of problematic coal and submission to independent laboratories for analyses.
 - Noko Analytical Services
 - Inspectorate M&L
 - MAK Analytical
- Stack emission tests and other environmental requirements etc.
- Water and Fire side treatment
- Boiler Maintenance
- Boiler pressure test and 3 yearly inspections
- Boiler operator training



Technical Questions /Frequently Asked Questions

The fire in the boiler keeps “running away” – Why?

- Cold ignition arch
- Low volatiles in coal
- Coal sizing too big
- Stoker speed too fast
- To much air

The chain grate is too hot – Why?

- Fuel bed too thick, resulting in insufficient cooling by FD fan
- Uneven air destitution

The boiler pressure stays low – Why?

- Increased steam requirement too quickly
- Fuel bed is too thin
- Stoker speed too slow
- Coal Quality

Consistent dark chimney smoke and high CO₂ reading – Why?

- Coal bed is too thick
- Incorrect air/fuel ratio
- Dirty fire tubes / Grid arresters
- Excessive high volatile content in coal

What is the desired carbon dioxide (CO₂) percentage?

The CO₂ content gives an indication of the combustion efficiency in the furnace and should be about 13%. A low CO₂ reading is an indication that volatiles are not completely burnt

HELPFUL CONVERSIONS:

MASS

Units:

Metric ton (t) = tonne = 1000 kilograms (= 2204.6 lb)

Imperial or Long ton (lt) = 1016.05 kilograms (= 2240 lb)

Short (US) ton (st) = 907.19 kilograms (= 2000 lb)

Conversions:

From **long ton** to **metric ton** multiply by 1.016

From **short ton** to **metric ton** multiply by 0.9072

Mt – million tonnes

Mtce – million tonnes of coal equivalent (= 0.697 Mtoe)

Mtoe – million tonnes of oil equivalent

Calorific Values (CV)

Units:

kcal/kg – Kilocalories per kilogram

MJ/kg* – Megajoules per kilogram

Btu/lb – British Thermal Units per pound

* 1 MJ/kg = 1 Gigajoule/tonne (GJ/t)

Gross & Net Calorific Values

Gross CV or higher heating value' (HHV) is the **CV** under laboratory conditions.

Net CV or 'lower heating value' (LHV) is the useful calorific value in boiler plant. The difference is essentially the latent heat of the water vapour produced

Conversions – Units

From **kcal/kg** to **MJ/kg** multiply by 0.004187

From **kcal/kg** to **Btu/lb** multiply by 1.800

From **MJ/kg** to **kcal/kg** multiply MJ/kg by 238.8

From **MJ/kg** to **Btu/lb** multiply MJ/kg by 429.9

From **Btu/lb** to **kcal/kg** multiply Btu/lb by 0.5556

From **Btu/lb** to **MJ/kg** multiply Btu/lb by 0.002326

Conversions – Gross/Net (per ISO, for As Received figures)

kcal/kg: Net CV = Gross CV – 50.6H – 5.85M – 0.191O

MJ/kg: Net CV = Gross CV – 0.212H – 0.0245M – 0.0008O

Btu/lb: Net CV = Gross CV – 91.2H – 10.5M – 0.34O

– where **M** is % Moisture, **H** is % Hydrogen, **O** is % Oxygen (from ultimate analysis*, also As Received).

* *Ultimate analysis determines the amount of carbon, hydrogen, oxygen, nitrogen and sulphur.*

For typical bituminous coal with 10% **M** and 25% **Volatile Matter**, the differences between gross and net calorific values are approximately as follows:

260 kcal/kg	1.09 MJ/kg	470 Btu/lb
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Power Generation

1 **MWh** = 3600 MJ

1 **MW** = 1 MJ/s

1 MW (thermal power) [**MWth**] = approx 1000 kg steam/hour

1 MW (electrical power) [**MWe**] = approx MWth / 3

A 600 MWe coal-fired power station operating at 38% efficiency and 75% overall availability will consume **approximately**:

- Bituminous coal (CV 6000 kcal/kg NAR*): 1.5 Mt/annum
- Brown coal (CV 2250 kcal/kg NAR*): 4.0 Mt/annum