Altret Industries Private Limited

πBOND

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Combustion and Thermal resistance to heat transfer essentially governs the efficiency of boiler. The fuel quality plays a very critical role to output i.e equivalent evaporation ratio. Particularly in small plant where the proficient laboratory is not available, industries very much rely on fuel suppliers or third party laboratory. To differentiate calorific value based on as receive bases or dry bases, counting moisture inherent and total bases is the very important and should be tracked by operational staff of thermal system.

This article gives the brief description of coal conversion statics.

COAL CONVERSION STATISTICS

Basis of Analysis Definitions:

As Received (ar) : Includes Total Moisture (TM)
Air Dried (ad) : Includes Inherent Moisture (IM) only
Dry Basis (db) : Excludes all Moisture
Dry Ash Free (daf) : Excludes all Moisture & Ash

The Proximate Analysis of any coal i.e. the % content of Moisture, Ash (A), Volatile Matter (VM), Fixed Carbon (FC) - also Sulphur (S) and Calorific Value (CV) - can be expressed on any of the above bases.

Conversions:

To obtain:-	Air Dry	Dry Basis	As Received
		- multiply	
ar by:	(100 - IM %) / (100 - TM %)	100 / (100 - TM %)	-
ad by:	-	100 / (100 - IM %)	(100 - TM %) / (100 - IM %)
db by:	(100 - IM%) / 100	-	(100 - TM%) / 100

[For daf, multiply db by 100/ (100-A)]

Example:

	ar	ad	db	daf
TM	11.0	-	-	-
IM	2.0	2.0	-	-
Ash	12.0	13.2	13.5	-
VM	30.0	33.0	33.7	39.0
FC	47.0	51.8	52.8	61.0
Sulphur	1.0	1.1	1.12	-

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* - Mega joules per kilogram
- Btu/lb - British Thermal Units per pound

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

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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

Sources: GWC Coal Handbook & IEA Clean Coal Centre References:
http://www.worldcoal.org/resources/coal-statistics/coal-conversion-statistics/

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