GCV from Proximate Analysis (Parikh Correlation)

Estimates the gross calorific value of coal or biomass from its proximate analysis (fixed carbon, volatile matter, ash) by the Parikh, Channiwala and Ghosal correlation.

Method: J. Parikh; S.A. Channiwala; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Fixed carbon, dry basis	40.000	%
Volatile matter, dry basis	25.000	%
Ash, dry basis	35.000	%
Total moisture, as received	10.000	%

Calculated results

Parameter	Value	Unit
Gross calorific value, dry basis	17,769	kJ/kg
Gross calorific value, as received	15,992	kJ/kg

Notes for this case

- An estimate: the correlation's average error is a few per cent. Use a bomb-calorimeter value for guarantees and efficiency tests.

Formula and method

$$GCV_d\,[\mathrm{MJ/kg}] = 0.3536\,FC + 0.1559\,VM - 0.0078\,ASH \quad (\%\ \mathrm{dry}) \qquad GCV_{ar} = GCV_d\,(1 - M)$$

Variables

FC	fixed carbon, dry basis	–
VM	volatile matter, dry basis	–
ASH	ash, dry basis	–
M	total moisture as received	–
GCV_d	GCV dry basis	J/kg
GCV_{ar}	GCV as received	J/kg

Method and standards

Parikh, Channiwala and Ghosal (2005) correlation of higher heating value with proximate analysis on a dry basis; as-received value by the basis relation.

Assumptions and limits

- Dry-basis proximate analysis adding to 100 % (within ±2 %; it is normalised, with a note above ±0.5 %); correlation accuracy a few per cent.
- The correlation was fitted to a wide set of coals and biomasses; very high-ash fuels (above about 40 % ash, as some Indian coals) may lie outside the fitted data and are less certain.
- An air-dried or as-received analysis entered as dry cannot be detected; convert it to dry first.

References

- J. Parikh
- S.A. Channiwala
- G.K. Ghosal
- Fuel 84 (2005) 487–494

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/boilers-power-plant/combustion/gcv-from-proximate

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.