Engine Brake Thermal Efficiency and Specific Fuel Consumption

Brake thermal efficiency, brake specific fuel consumption and heat rate of an engine or DG set from brake power, fuel flow and calorific value.

Method: η_bt = BP/(ṁ_f CV); BSFC = ṁ_f/BP

Input parameters

Unit system: SI

Parameter	Value	Unit
Brake power	50.000	kW
Fuel consumption	12.500	kg/h
Fuel calorific value (net)	42.500	MJ/kg

Calculated results

Parameter	Value	Unit
Brake thermal efficiency	33.882	%
Brake specific fuel consumption	250.00	g/kWh
Heat rate	10,625	kJ/kWh

Notes for this case

- Use net CV for engine efficiency, as engine makers do.

Formula and method

$$\eta_{bt} = \frac{BP}{\dot{m}_f CV}, \quad BSFC = \frac{\dot{m}_f}{BP}, \quad HR = \frac{1}{\eta_{bt}}$$

Variables

BP	Brake power	W
$\dot{m}_f$	Fuel consumption	kg/s
CV	Fuel calorific value (net)	J/kg
η_{bt}	Brake thermal efficiency	-
$BSFC$	Brake specific fuel consumption	kg/J
HR	Heat rate	J/J

Method and standards

Definitions.

Assumptions and limits

- Steady load.
- An efficiency of 100 % or more is rejected; above 60 % is flagged as unlikely.

References

- η_bt = BP/(ṁ_f CV); BSFC = ṁ_f/BP

Report details

Report reference	FCC-KX8C-NF6N (the same inputs always give the same reference)
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Release checks	2 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/automotive/engine/engine-thermal-efficiency-bsfc

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.