Brake Mean Effective Pressure and Engine Torque

Brake mean effective pressure of an engine from torque and displacement for four- or two-stroke cycles, the power at a speed, and torque per litre.

Method: bmep = 2πn_RT/V_d (Heywood, Internal Combustion Engine Fundamentals (McGraw-Hill, 1988), ch. 2)

Input parameters

Unit system: SI

Parameter	Value	Unit
Brake torque	250.00	N·m
Total displacement	2.0000	L
Cycle	Four-stroke	
Speed	4,000.0	rpm

Calculated results

Parameter	Value	Unit
Brake mean effective pressure	15.708	bar
Brake power	104.72	kW
Torque per litre (N·m/L)	125.00	

Notes for this case

- Typical bmep at maximum torque: naturally aspirated petrol 10–13 bar, turbo petrol 18–25 bar, truck diesel 18–25 bar, large gas engines 20–24 bar.

Formula and method

$$bmep = \frac{2\pi n_R T}{V_d}, \quad P_b = 2\pi n T$$

Variables

T	Brake torque	N·m
V_d	Total displacement	m³
cycle	Cycle	-
n	Speed	1/s
n_R	Revolutions per power stroke: 2 for four-stroke, 1 for two-stroke (from the cycle)	-
$bmep$	Brake mean effective pressure	Pa
P_b	Brake power	W
T/V_d	Torque per litre (N·m/L)	-

Method and standards

Definition.

Assumptions and limits

- Brake (shaft) values.
- A bmep above about 30 bar is flagged as beyond typical engines.

References

- bmep = 2πn_RT/V_d (Heywood, Internal Combustion Engine Fundamentals (McGraw-Hill, 1988), ch. 2)

Report details

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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/bmep-engine-torque

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.