

Thermodynamic Cycle Analysis (Otto/Diesel)

Sample document with complete example values. It shows the report the purchased export produces for YOUR input - it is not itself a report for any part.

Project: Sample project

Part/Position: no real part

Prepared by: Sample, not released

Thermal efficiency of the ideal Otto cycle (constant-volume combustion): $\eta_{th} = 60.19\%$.

Input

Cycle type	Otto cycle (constant-volume combustion)
Compression ratio ε	10
Isentropic exponent κ	1.4

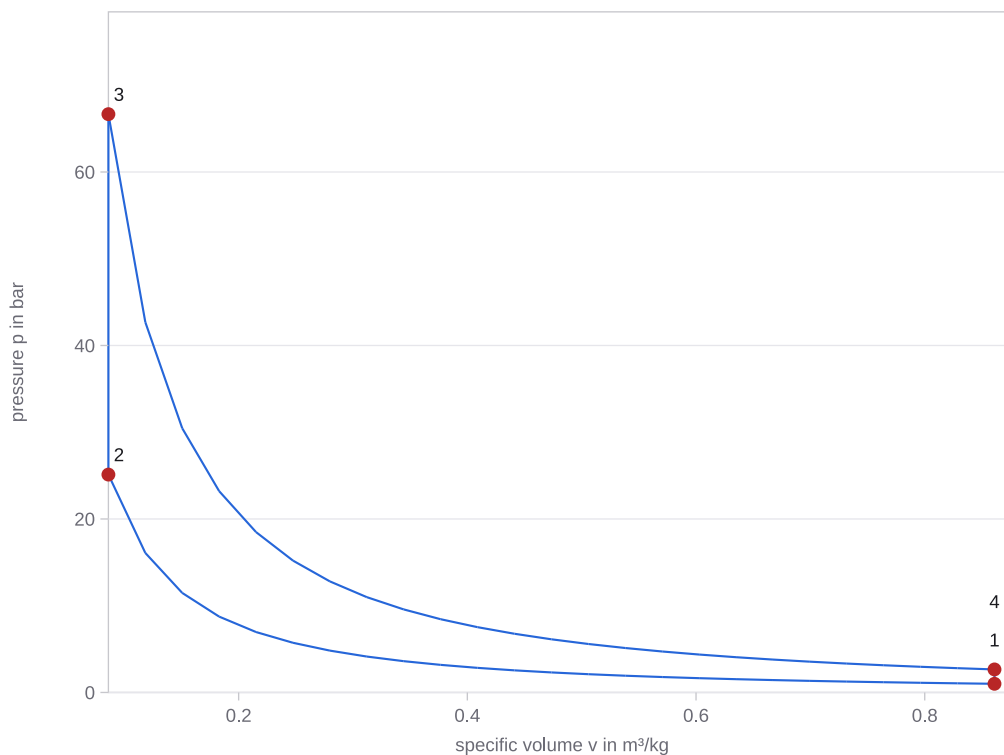
Results

Thermal efficiency η_{th}	60.19 %
Heat input q_{in}	894.32 kJ/kg
Heat rejected q_{out}	356.03 kJ/kg
Net work w	538.28 kJ/kg
Mean effective pressure p_m	6.95 bar

State Points

Point	p [bar]	v [m³/kg]	T [K]
1	1	0.861	300
2	25.12	0.0861	753.57
3	66.67	0.0861	2,000
4	2.65	0.861	796.21

p-V Diagram



Calculation basis

Ideal air-standard cycles with fully isentropic compression and expansion and an ideal gas as the working medium. The Otto cycle (constant-volume combustion) has an efficiency of $\eta = 1 - 1/\varepsilon^{\kappa-1}$, depending only on the compression ratio and the isentropic exponent. The Diesel cycle (constant-pressure combustion) has $\eta = 1 - (1/\varepsilon^{\kappa-1}) \cdot (\varphi^{\kappa-1}/(\kappa \cdot (\varphi-1)))$; the factor containing the cutoff ratio φ is always > 1 , which is why the Diesel cycle has a lower efficiency than the Otto cycle for the same ε . State points, heat quantities and mean effective pressure follow from the ideal-gas equations of state with $c_v = R/(\kappa-1)$ and $c_p = \kappa \cdot c_v$. Friction, heat conduction, incomplete combustion and gas exchange are not considered.

About this sample

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