

Power Cycles

Mechanical Engineering

Five ideal cycles, their efficiency expressions and what limits each.

Ideal air-standard and vapour cycles. Real plant sits well below these.

Cycle	Ideal efficiency	Found in
Carnot	$1 - T_{\text{cold}} \div T_{\text{hot}}$	The upper bound only
Otto	$1 - 1 \div r^{(\gamma-1)}$	Petrol engines
Diesel	Otto form, cut-off term	Compression ignition
Brayton	$1 - 1 \div r_p^{((\gamma-1)/\gamma)}$	Gas turbines
Rankine	Net work $\div$ heat added	Steam power plant

r is compression ratio, r_p is pressure ratio, $\gamma = c_p \div c_v$. No cycle can beat Carnot between the same two temperatures.