

Entropy & Irreversibility

Mechanical Engineering

What entropy actually measures, and where real machines lose work.

Entropy measures how much of an energy transfer is no longer available to do useful work.

CARNOT EFFICIENCY

$$1 - T_{\text{cold}} \div T_{\text{hot}}$$

TURBINE ISENTROPIC

typically 0.85 to 0.92

UNITS

kJ per kg per K

- Reversible change: $dS = \delta Q \div T$, T in kelvin
- Real processes generate entropy; none destroy it
- Isentropic means adiabatic AND reversible
- Friction, mixing and heat across a gap make it
- Isentropic efficiency compares real with ideal
- Entropy generated is work you will never get back

LOOK FOR IT

A throttle destroys no energy, yet it raises entropy and destroys work.

Every temperature in an entropy or Carnot expression is absolute, in kelvin. Celsius gives nonsense.