

Isentropic Efficiency

Also called **adiabatic efficiency**, **2nd Law Efficiency**

Turbines

$$\eta_T = \frac{\text{Actual turbine work}}{\text{Isentropic turbine work}} = \frac{w_a}{w_s} = \frac{h_1 - h_{2a}}{h_1 - h_{2s}}$$

Common values ~ 90% for large turbines
~70% or less for small turbines

Compressors

$$\eta_C = \frac{\text{Isentropic compressor work}}{\text{Actual compressor work}} = \frac{w_s}{w_a} = \frac{h_{2s} - h_1}{h_{2a} - h_1}$$

Common values ~ 80 to 90% for well designed ones

Nozzles

$$\eta_N = \frac{\text{Actual exit KE}}{\text{Isentropic exit KE}} = \frac{\vec{V}_{2a}^2}{\vec{V}_{2s}^2} = \frac{h_1 - h_{2a}}{h_1 - h_{2s}}$$

Common values ~ above 90% usually