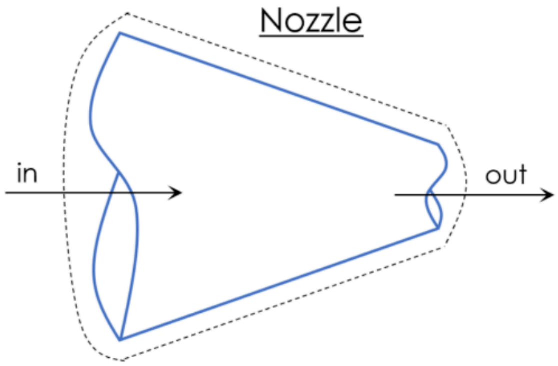
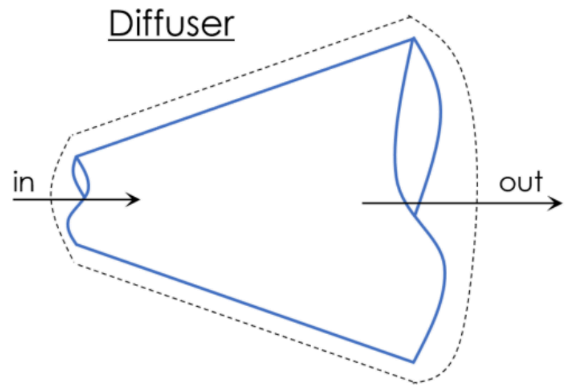
ROC and Mollier Diagrams

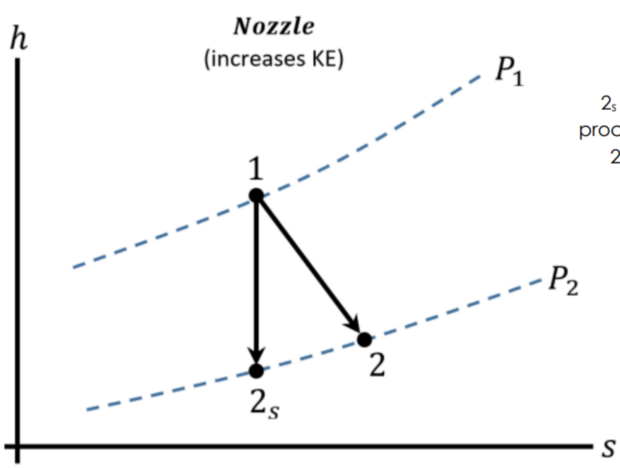
Mollier Diagrams:



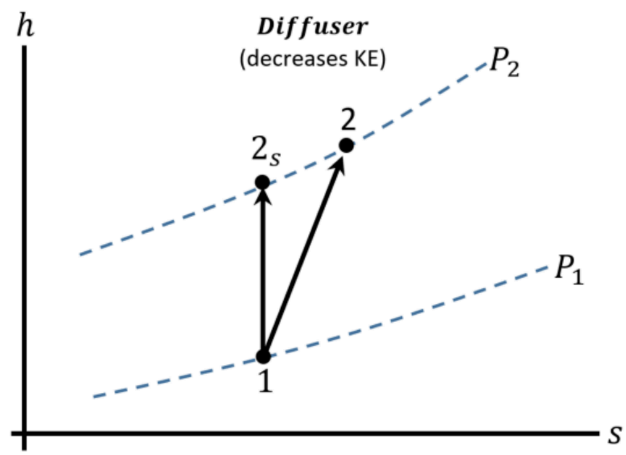
Assumptions:

- Steady flow
- Single stream
- Adiabatic ($\Delta Q = 0$)
- No work *(W=0)*
- Open system
- Control volume
- $\Delta PE = 0$ (but $\Delta KE \neq 0$)





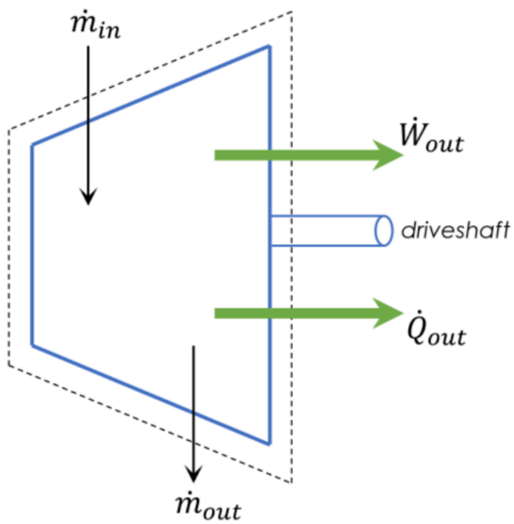
2_s represents a reversible process (Carnot/ideal), while 2 represents an actual process.



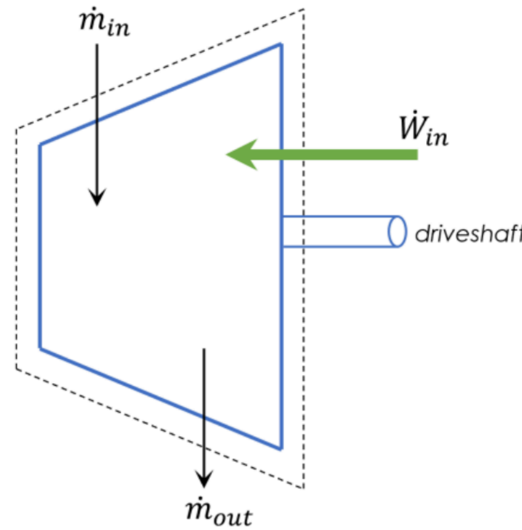
Where the energy balance equation reduces to:

$$h_{in} - h_{exit} = \frac{1}{2}\left(V_{exit}^{2} - V_{in}^{2}\right)$$

Turbines

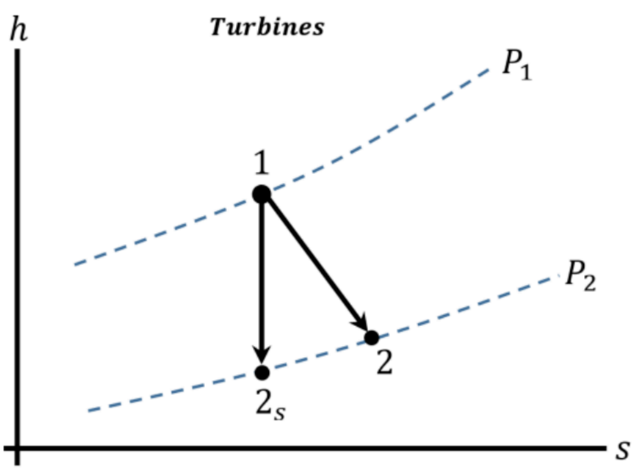


Compressor/Pump

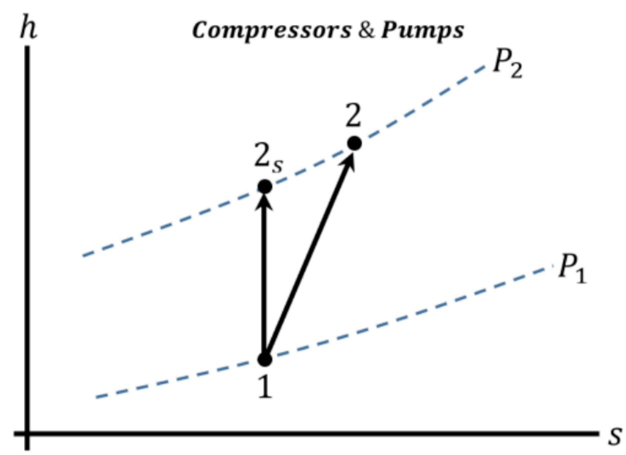


Assumptions:

- Steady state ($\dot{m}_{in} = \dot{m}_{out}$)
- Open system
- Control volume
- $\Delta PE = \Delta KE = 0$



$$\dot{W}_{in} = \dot{m}(h_{exit} - h_{in})$$



$$\dot{W}_{out} = \dot{m}(h_{exit} - h_{in}) - \dot{Q}_{out}$$

Isentropic efficiency:

$$\eta_T = \frac{h_1 - h_2}{h_1 - h_{2s}}$$

Isentropic efficiency:

$$\eta_T = \frac{h_{2s} - h_1}{h_2 - h_1}$$

For more information, visit a tutor. All appointments are available in-person at the Student Success Center, located in the Library, or online. Adapted from Hibbeler, R.C. (2014). *Mechanics of Materials* (9th Edition). Boston, MA: Prentice Hall.