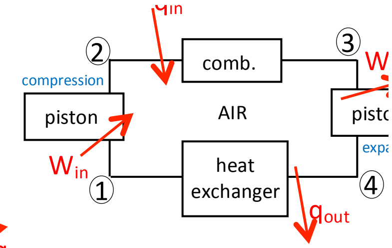
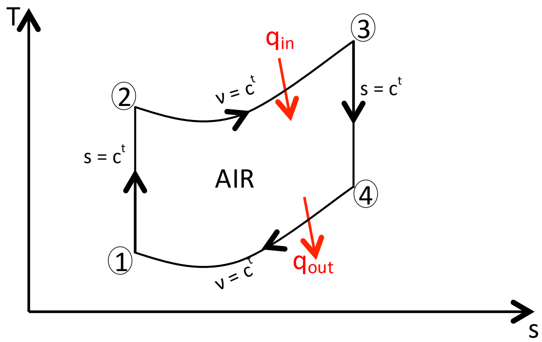
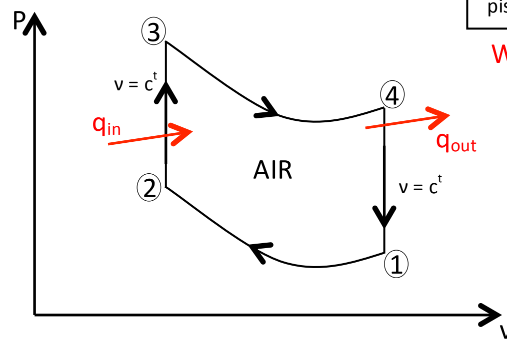
Otto Cycle



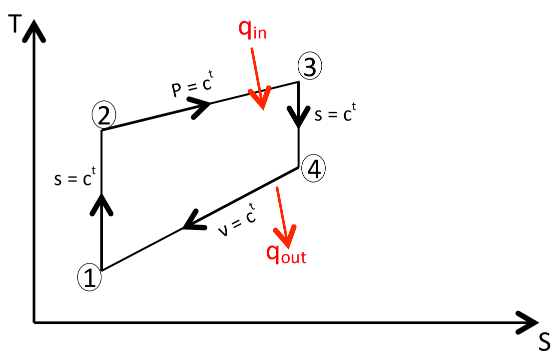


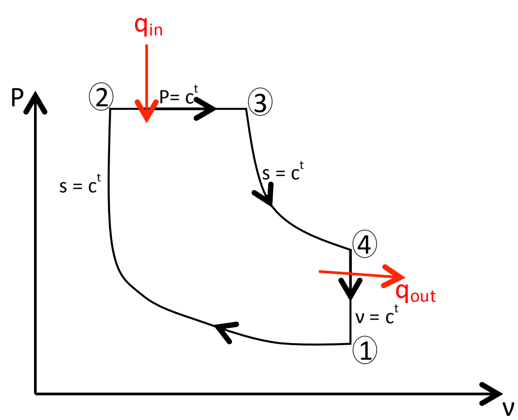


*OTTO = Ideal combustion engine (AIR)

$$\eta_{th_{OTTO}} = 1 - \frac{1}{r^{(k-1)}}, r = comp'n\ ratio = \frac{V_{max}}{V_{min}} = \frac{v_1}{v_2} = \frac{v_4}{v_3}$$

Diesel Cycle





*DIESEL = Ideal compression-ignition engine (AIR)

$$r_c = \frac{v_3}{v_2}, \eta_{th_{DIESEL}} = \frac{w_{net}}{q_{in}} = 1 - \frac{q_{out}}{q_{in}}$$

$$r = compression\ ratio = \frac{v_1}{v_2}$$

When you compare η_{th} to η_{CARNOT},

$$\eta_{carnot} = 1 - \frac{T_L}{T_H} = 1 - \frac{T_{lowest\ T}}{T_{highest,max}}$$

$$\dot{W}_{net} = \eta_{th} \times \dot{Q}_{in}$$

$$\dot{W}_{net} = W_{net}\dot{m} = (q_{in} - q_{out})\dot{m} = \dot{q}_{in} - \dot{q}_{out}$$

$$MEP = \frac{W_{net}}{v_1 - v_2}$$

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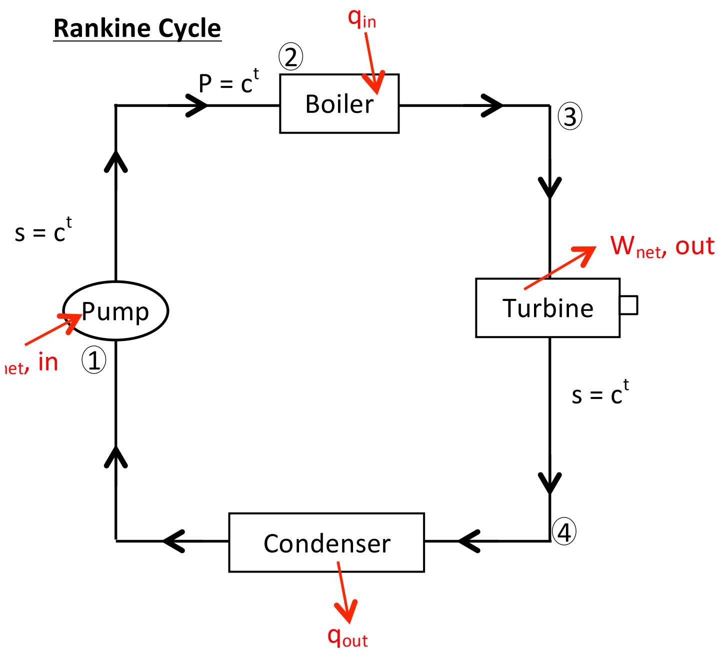
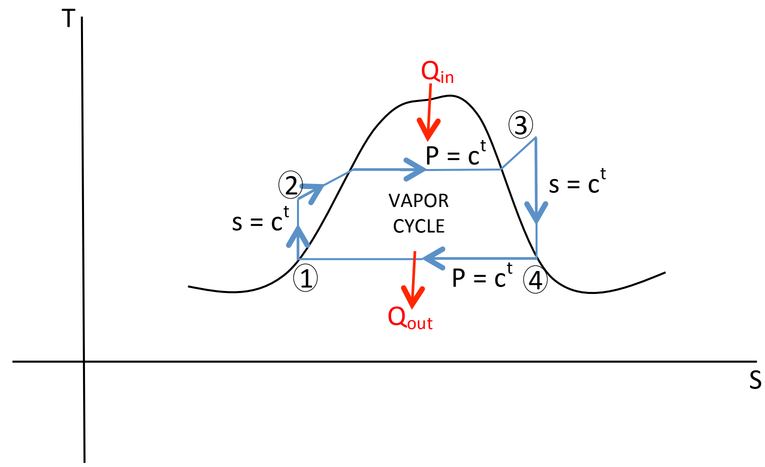
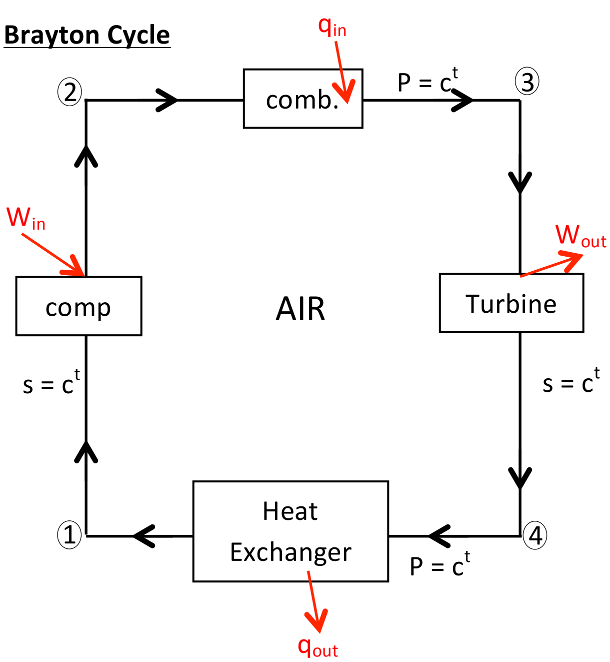
Rankine Cycle

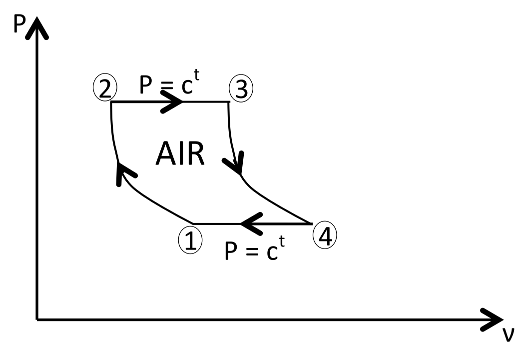


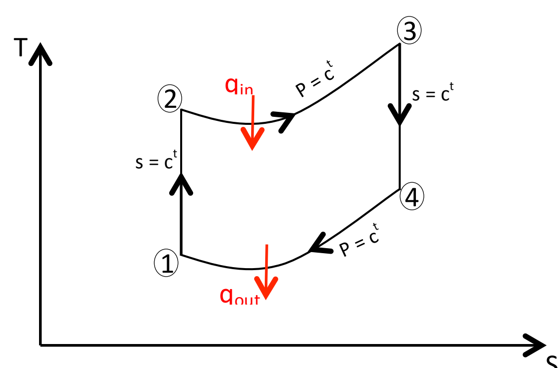


$$\eta_{th} = \frac{W_{net}}{q_{in}} = 1 - \frac{q_{out}}{q_{in}}$$

Brayton Cycle







$$\eta_{th(Brayton)} = \frac{W_{net}}{q_{in}} = \frac{W_{34} + W_{21}}{q_{in}}$$

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