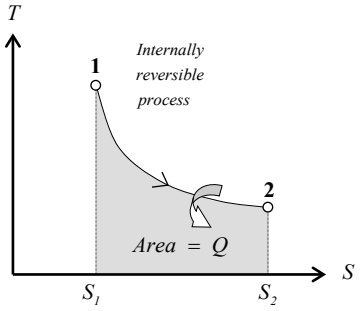
7-5 T-S DIAGRAM

Internally reversible process

$$dS = \left(\frac{\delta Q}{T}\right)_{int\,rev} \quad (7\text{-}4) \quad \Rightarrow \quad \delta Q = TdS \quad (7\text{-}14)$$

For internally reversible process

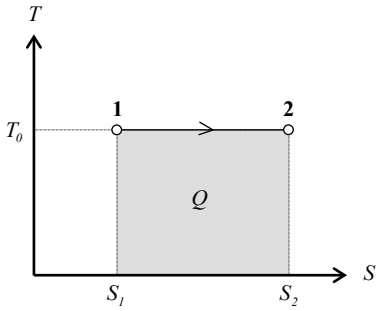


$$Q = \int_1^2 TdS \quad (7\text{-}15)$$

Heat transfer during the internally reversible process

$$q = \int_1^2 Tds \quad (7\text{-}17)$$

Reversible Isothermal Process



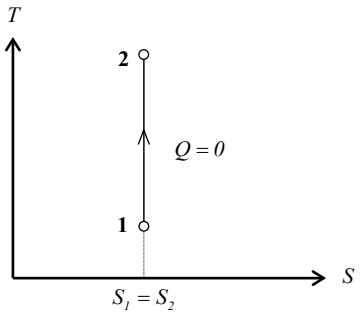
$$Q = T_0 \cdot (S_2 - S_1) \quad (7\text{-}18)$$

isothermal process is internally reversible

$$q = T_0 \cdot (s_2 - s_1) \quad (7\text{-}19)$$

7-4 Isentropic process

(S = *const* during process)

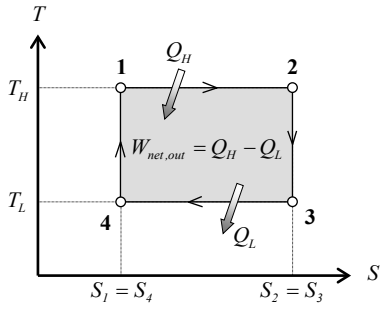


$$\Delta S = S_2 - S_1 = 0 \quad (7\text{-}13)$$

reversible adiabatic ⇓ *isentropic process*

isentropic process is associated with internally reversible adiabatic process

Carnot Cycle



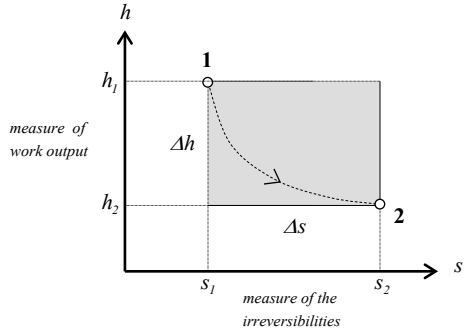
$$Q_{net,in} = W_{net,out}$$

$$W_{net,out} = Q_H - Q_L$$

Mollier diagram *(Table A-10)*

h-s diagram is useful for analysis of steady-flow devices

Richard Mollier (1863 – 1935)



$$w = \Delta h$$

For adiabatic steady-flow devices: nozzles, turbines, compressors, etc.

$$q = T\,\Delta s$$

For isothermal processes