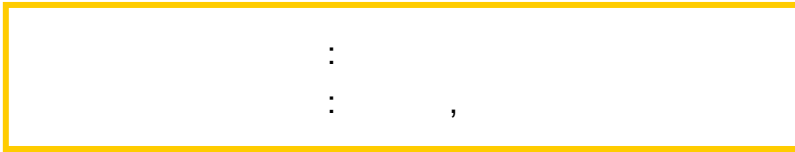


Thermodynamic Analysis of Processes

가
Lost Work

◆ Calculation of Ideal Work

Ideal (process) 가 가 가



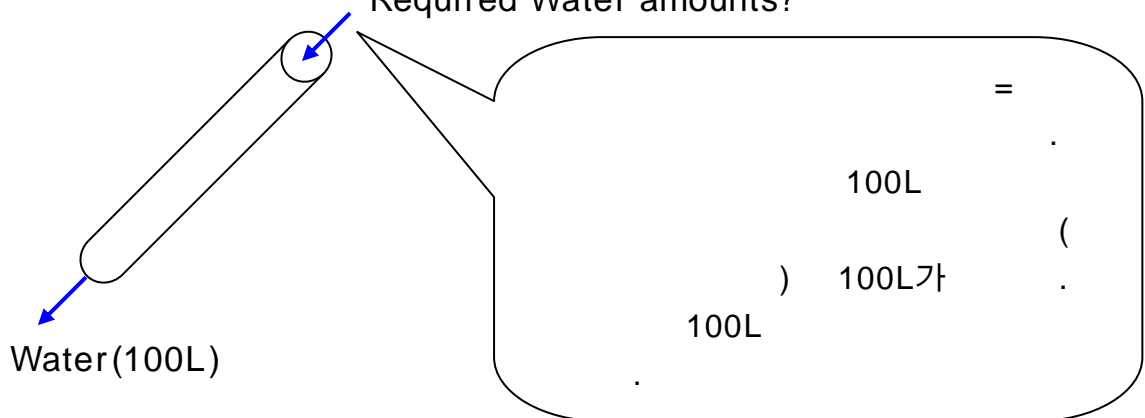
Ideal Work

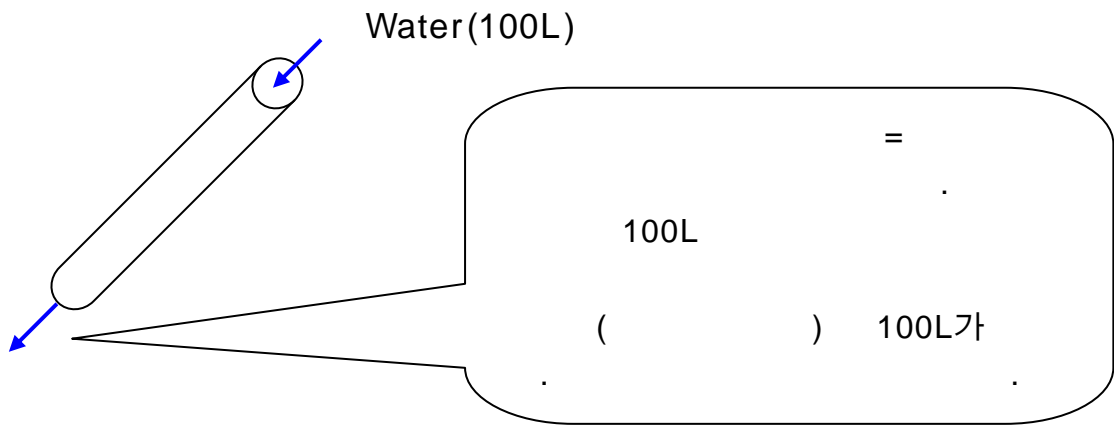
Ideal Work

100L

(Process)

Required Water amounts?





Ideal Work

가

가

1. control volume(가 system)

가

2. Control volume

가

Entropy generation = 0

$$\Delta(S\dot{m})_{fs} = \frac{\dot{Q}}{T_\sigma} + \dot{S}_{G,total} \rightarrow T_\sigma \Delta(S\dot{m})_{fs} = \dot{Q} \dots\dots\dots (1)가$$

(1)

$$\Delta[(H + \frac{1}{2}u^2 + zg)\dot{m}]_{fs} = T_\sigma \Delta(S\dot{m})_{fs} + W_s \dots\dots\dots (2)$$

(2) Work Ideal Work

$$\dot{W}_{ideal} = \Delta[(H + \frac{1}{2}u^2 + zg)\dot{m}]_{fs} - T_\sigma \Delta(S\dot{m})_{fs} \dots\dots\dots (3)$$

가 (3) kinetic & potential energy

ideal work

$$\dot{W}_{ideal} = \dot{m}(\Delta H - T_{\sigma}\Delta S)$$

m

$$W_{ideal} = \Delta H - T_{\sigma}\Delta S$$

Ideal Work T Actual Work 가

If $W_{ideal} > 0$

W_{ideal} = Minimum work required to bring about a given change in the properties of the flowing streams

$$\eta_i(\text{work required}) = \frac{W_{ideal}}{W_s}$$

If $W_{ideal} < 0$

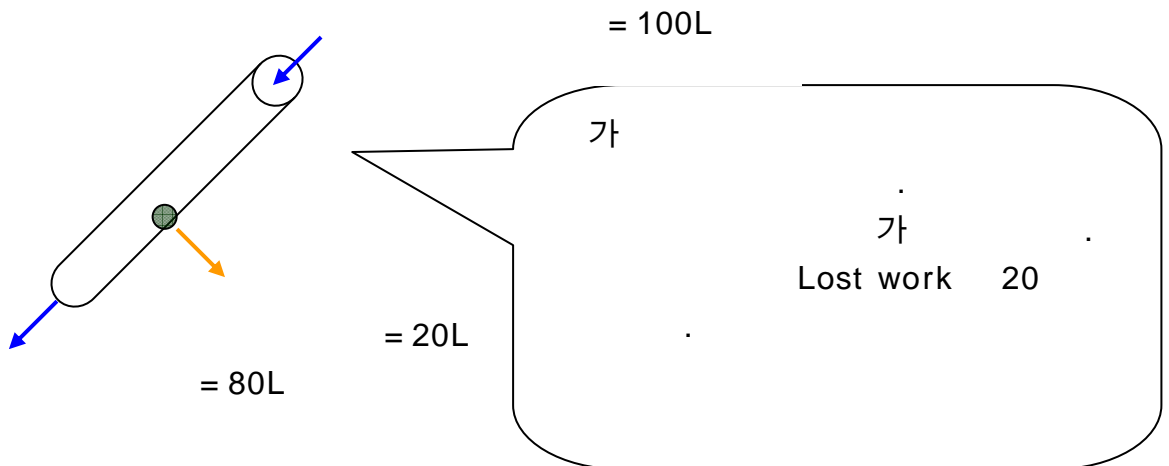
W_{ideal} = Maximum work obtainable from a given change in the properties of the flowing streams

$$\eta_i(\text{work produced}) = \frac{W_s}{W_{ideal}}$$

◆ Lost Work

Lost work

가



Lost Work

$$W_{\text{lost}} = W_s - W_{\text{ideal}}$$

$$\dot{W}_{\text{lost}} = \dot{W}_s - \dot{W}_{\text{ideal}}$$

$$\dot{W}_s = \Delta\left[\left(H + \frac{1}{2}u^2 + zg\right)\dot{m}\right]_{fs} - \dot{Q}$$

(1)

$$\dot{W}_{\text{ideal}} = \Delta\left[\left(H + \frac{1}{2}u^2 + zg\right)\dot{m}\right]_{fs} - T_\sigma \Delta(S\dot{m})_{fs}$$

Lost Work

$$\dot{W}_{\text{lost}} = T_\sigma \Delta(S\dot{m})_{fs} - \dot{Q}$$

Entropy

T

가

$$\Delta(S\dot{m})_{fs} = \frac{\dot{Q}}{T_\sigma} + \dot{S}_{G,\text{total}}$$

T

$$T_\sigma \dot{S}_{G,\text{total}} = T_\sigma \Delta(S\dot{m})_{fs} - \dot{Q}$$

Lost Work

$$\dot{W}_{lost} = T_{\sigma} \dot{S}_{G,total}$$

2
Lost Work process irreversibility $S_G = 0$

W_{lost} 0가 .