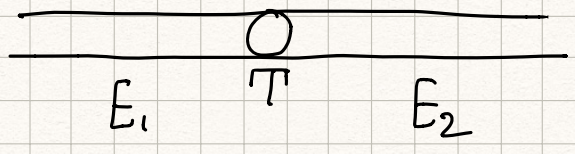
System

- Energy : ability to do work (J)
- Work :
- Power : rate of Energy/Work $\left(\frac{J}{s}\right) = (W)$

$$h_1 = h_2$$

$$\frac{P_1}{\gamma} + \frac{v^2}{2g} + z_1 = \frac{P_2}{\gamma} + \frac{v^2}{2g} + z_2$$

Turbine



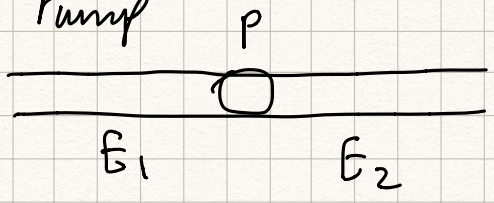
$E_1 > E_2$

$\Delta E = -W_T$

B. E

$h_1 = h_2 + h_T$

Pump



$E_1 < E_2$

$\Delta E = Q_p$

$h_1 = h_2 - h_p$

$$\frac{dE}{dt}_{syst} = \dot{Q} - \dot{W}$$

Energy Eq.

$$\dot{Q} - \dot{W} = \frac{dE_{cv}}{dt} + (\dot{E}_{out} - \dot{E}_{in})$$

V - kinetic
z - pot

$\dot{Q}$: Pump

$\dot{W}$: Turbine

$\frac{dE_{cv}}{dt} = 0$ if S.S.

$$W = F \cdot d$$

Velocity add α, correction

$\alpha \frac{V^2}{2g}$

Loss : due to expansion
due to contractions
due to entering a tank
due to exiting the tank