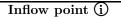
Typical Steady State Control Volume Problem Chart

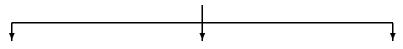
(Not complete material coverage)



Normally 4 variables are needed to fully determine it (since there is also an unknown velocity.)

2 known intensive variables

(May get away with T only in some approximations, eg, when using saturated values as an approximation for compressed liquids.)



Tables, eg B.1.1-B.1.4; pv or Tv diagrams; $v = v_f + x \left(v_q - v_f \right)$ and similar for u and h.

Ideal gas (applicable?) pv = RT (4 forms) Tables A5-A8 for u, h. Make do with the formulae for differences in intensive variables listed below under "Device"?

Remaining intensive variables p, T, v, (x,)u, h.

Amount of material going through per unit time

$$w = \dot{W}/\dot{m} \quad q = \dot{Q}/\dot{m} \qquad \dot{m} = \dot{V}/v = A\mathbf{V}/v \quad A = \frac{\pi}{4}D^2$$

Device or Control Volume

C1: Type of Device? Given that $\dot{Q} = 0$?

Do the given device characteristics add info about (i) or (e)?

C2: Mass: Adds info about (i) or (e)?

 $\dot{Q} + \sum \dot{m}_i \left(h_i + \frac{1}{2} \mathbf{V}_i^2 ? + g Z_i ? \right) = \sum \dot{m}_e \left(h_e + \frac{1}{2} \mathbf{V}_e^2 ? + g Z_e ? \right) + \dot{W}$

Adds info about (i) or (e)?

C3: Device has $\dot{W} = 0$?

For ideal gasses:

$$h_2 - h_1 = \int_1^2 C_p \, dT \approx C_{p_{\text{ave}}} (T_2 - T_1)$$

 $\sum \dot{m}_i = \sum \dot{m}_e$

For compressed liquids, by approximation, best at constant pressure:

$$h_2 - h_1 \approx C_{(p)}_{\text{ave}} (T_2 - T_1)$$

Exit point (e)

Same procedures as entrance point (i)