Differential Form of Energy Conservation For Quasi-1D, Steady Flow

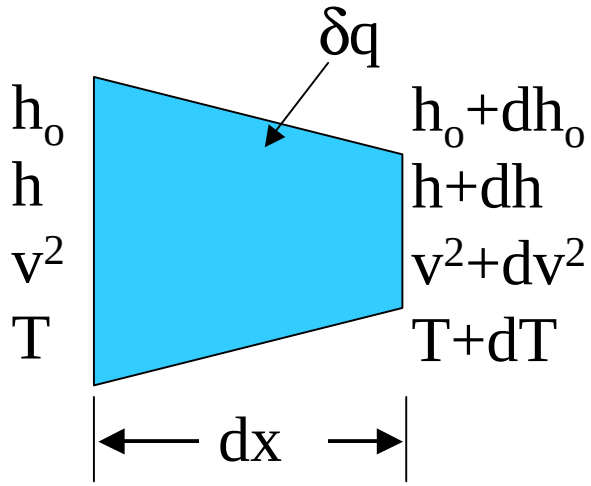
- Also assume no work but flow work (e.g., no viscosity), thermally/calorically perfect gas

$$\delta q = dh_o = dh + d\left(\frac{v^2}{2}\right) = c_p dT + \frac{1}{2} dv^2$$

$$\frac{\delta q}{c_p T} = \frac{dT}{T} + \frac{1}{2c_p T} dv^2$$

$$\frac{dT}{T} = \frac{\delta q}{c_p T} - \frac{(\gamma - 1)}{2} \frac{v^2}{\gamma RT} \frac{dv^2}{v^2}$$

M^2



also $\delta q = dh_o = (c_p dT_o)$

- Stagnation enthalpy/temp. constant for adiabatic flow (+no work but flow work)