



The First Law with Mass Flow

First Law of Thermodynamics for a Control Volume

rate of total energy increase within the CV

rate at which work is done by the CV on the surroundings by everything other than pressure at inlets/outlets, e.g., electric, shaft, spring

$$\frac{dE_{CV}}{dt} = \dot{Q}_{into\ CV} - \dot{W}_{by\ CV, other\ than\ press} + \sum_{in} \dot{m}(h + ke + pe) - \sum_{out} \dot{m}(h + ke + pe)$$

rate at which energy enters the CV via heat transfer

rate at which total enthalpy enters the CV

rate at which total enthalpy leaves the CV

Reminders

1. Identify your control volume.
2. Draw your EFD.
3. State major assumptions where you use them.

Diffusers



Nozzles



Heat Exchangers

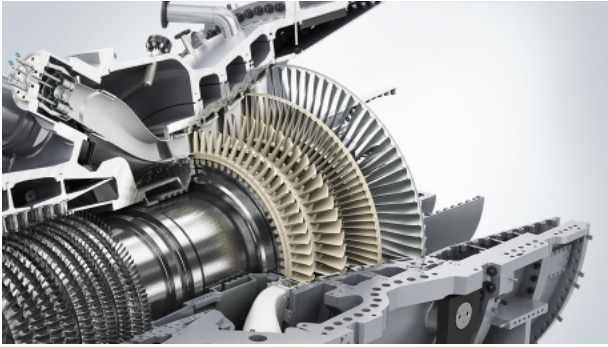


(Boilers and condensers are types of heat exchangers.)

Throttling Devices



Turbines



Compressors/Pumps

