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Methodology for Energy Analysis

The following methodology for energy analysis is useful.

- Make a simple schematic of the device or system, define a control volume, and show the control surface.
- Show clearly all points where the fluid enters and leaves the control surface. If there are no inlets and outlets, then the system is closed.
- If there is mechanical work input or output, show a shaft penetrating the control surface. Show the shaft work $\dot{W}_{\text{shaft}}$ entering or leaving by an arrow pointing into or away from the control surface.
- Show the heat energy $\dot{Q}$ entering or leaving the control volume by an arrow pointing into or away from the control surface.
- If there are other forms of energy entering or leaving the control volume other than those carried by the fluid crossing the control surface, identify them and show them on the control volume schematic with suitable arrows.
- Make a list of the properties of the fluid entering and leaving the control volume that are pertinent to the energy analysis.
- If any of the fluid properties required for the energy analysis are missing, see whether they can be obtained by use of (a) the equation of state, (b) conservation of mass, or (c) the equation

for the process which the fluid experiences as it passes through the control volume.

- If appropriate, make suitable simplifications which are consistent with the physics of the device so that some of the terms of the energy equation can be neglected. For example, changes in the kinetic energy and the potential energy of a fluid as it passes through a feed pump, a steam generator, a superheater, a reheater, or a combustion chamber can often be taken to be zero.
- Use the appropriate form of the First Law of Thermodynamics for a Control Volume FLOT/CV.
- Summarize the results of the analysis, and comment on your observations.