First law of thermodynamics

$$đQ = dU - đW$$

Heat supplied **to** the system

Work done **on** the system

For compression (or expansion) of a gas

$$đQ = dU + pdV$$

Configuration Work

This is the work done in a reversible process given by the product of some intensive variable (y) and the change in some extensive variable (X). The most general case would be:

$$đW = \sum_i y_i dX_i, \quad i = 1, 2, \ldots n.$$

- **We showed that $đW = -pdV$**
- **$đW$ is called the configuration work; it is an inexact differential, i.e. work is not a state variable.**
- **The amount of work done changing the configuration of a system from one state to another depends on how the work is done, i.e. on the path taken between the final and initial states. The path must be specified in order to calculate work via integration.**

Dissipative Work

- **This is the work done in an irreversible process; it is always done 'on the system'.**
- **Total work is the algebraic sum any configuration work and any dissipative work.**
- **If a process is reversible, then dissipation is necessarily zero.**

Examples: Stirring
Resistive electrical heating
Frictional work
Plastic deformation
Many chemical reactions