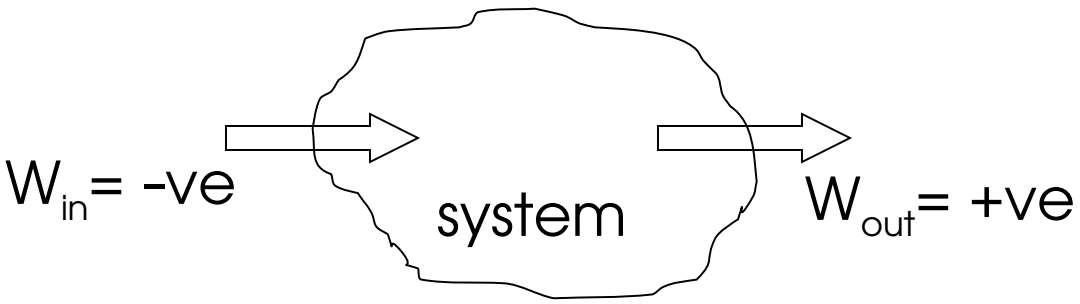
WORK, W (J, kJ)

Work —Energy that is *crossing the boundary* other than heat (electrical, stirrer, shaft, moving piston, etc.)

-Not a property (related to *process*)
-Mode of energy *transfer*



$$w = \frac{W}{m} \quad \left[\frac{\text{kJ}}{\text{kg}}\right]$$

$$\frac{W}{t} = \dot{W} \quad \left[\frac{\text{kJ}}{\text{s}} = \text{kW}\right]$$ = rate of work = power

$$\int_1^2 \delta W = W_{12}$$

Depends on path

Types of Work

- Work
  - Electrical $W_{el} = \int_1^2 VIdt$
  - Mechanical $W = \int_1^2 F \cdot ds$
    - Boundary $W_b = \int_1^2 p \cdot dV$
    - Gravitational $W_g = mg(z_2 - z_1)$
    - Acceleration $W = \frac{1}{2} m(\vec{V}_2^2 - \vec{V}_1^2)$
    - Shaft $W = 2\pi n \tau$
    - Spring $W = \frac{1}{2} k(x_2^2 - x_1^2)$