多变过程方程的推进功和技术功推导

对于理想气体多变过程方程：有

$$PV^n = C \qquad PV = RT$$

有： $W_t = -\int V dp$

我们 由 $PV^n = C$，$\therefore dp \cdot V^n + P \cdot n V^{n-1} dV = 0$

故： $dp = -np \dfrac{1}{V} dV$

代入：有：

$$W = \int_1^2 + V \cdot np \frac{1}{V} dV = n\int_1^2 p \, dV$$

故有 $W_t = -\int V dp = n\int_1^2 p \, dV$

$$= n \cdot W$$

由于 $\int_1^2 p \, dV$ 可以通过 $P_1 V_1^n = PV^n$ 获取，则 $P = \dfrac{P_1 V_1^n}{V^n}$ →

$$W = \int_1^2 \frac{P_1 V_1^n}{V^n} dV$$

$$= -\frac{1}{n-1} \frac{P_1 V_1^n}{V^{n-1}}\Big|_1^2 = -\frac{1}{n-1} \cdot \left(\frac{P_1 V_1^n}{V_2^{n-1}} - \frac{P_1 V_1^n}{V_1^{n-1}} \right)$$

$$= -\frac{1}{n-1} \left[P_2 V_2 - P_1 V_1 \right] = \frac{(P_1 V_1 - P_2 V_2)}{n-1} = \frac{R(T_1 - T_2)}{n-1}$$

$\underset{\frown}{P_2 V_2^n}$