FORMULAS

$$PV = mRT$$

$$\underbrace{E_{in} - E_{out}}_{\text{Net energy transfer by heat, work, and mass}} = \underbrace{\Delta E_{system}}_{\text{Change in internal, kinetic, potential, etc., energies}} \quad \text{(kJ)}$$

$$Q - W = \Delta U + \Delta \text{KE} + \Delta \text{PE} \quad \text{(kJ)}$$

$$\Delta u = u_2 - u_1 = \int_1^2 c_v(T)\,dT$$

$$\Delta h = h_2 - h_1 = \int_1^2 c_p(T)\,dT$$

$$h = u + Pv$$

$$C_p = \frac{R \cdot k}{k-1} \qquad C_V = \frac{R}{k-1} \qquad c_p - c_v = \text{R} \qquad k = \frac{c_p}{c_v}$$

$$\eta = \frac{W_{net}}{\Sigma Q_{giren}}$$

$$z = \frac{v_{gerçek}}{v_{ideal}} \qquad P_v = zRT \qquad P_R = \frac{P}{P_{kr}} \qquad T_R = \frac{T}{T_{kr}}$$

$$x = \frac{m_g}{m}\ [\%] \qquad m = m_f + m_g \qquad 0 < x < 1$$
$$v_A = v_f + x(v_g - v_f) \qquad h_A = h_f + x(h_g - h_f)$$

Sabit Basınç Prosesi
(P=Constant)

$$\frac{V_1}{V_2} = \frac{\text{T}_1}{\text{T}_2}$$

$$Q = \Delta H$$
$$W_{12} = P(V_2 - V_1) = mR(T_2 - T_1)$$

Sabit Sıcaklık Prosesi
(T=constant)

$$\frac{P_1}{P_2} = \frac{\text{V}_2}{\text{V}_1}$$

$$W_{12} = mRTln\left(\frac{V_2}{V_1}\right) = Q$$

Sabit Hacim Prosesi
(V=sbt=Constant)

$$\frac{P_1}{P_2} = \frac{\text{T}_1}{\text{T}_2}$$

Adyabatik Proses

$$PV^k = sbt(const.)$$

$$\frac{P_1}{P_2} = \left(\frac{V_2}{V_1}\right)^k$$

$$\frac{T_1}{T_2} = \left(\frac{V_2}{V_1}\right)^{k-1}$$

$$\frac{T_1}{T_2} = \left(\frac{P_1}{P_2}\right)^{\frac{k-1}{k}}$$

$$W_{12} = \frac{mR(\text{T}_1 - \text{T}_2)}{k-1} = \frac{P_1V_1 - P_2V_2}{k-1}$$

Politropik Proses

$$PV^n = sbt(const.)$$

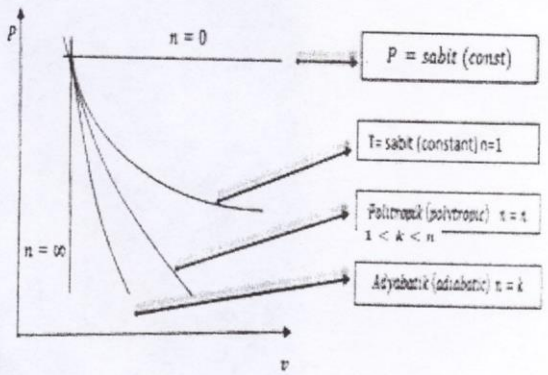
$$\frac{P_1}{P_2} = \left(\frac{V_2}{V_1}\right)^n$$

$$c_n = c_v\left(\frac{n-k}{n-1}\right)$$

$$W_{12} = \frac{mR(\text{T}_1 - \text{T}_2)}{n-1} = \frac{P_1V_1 - P_2V_2}{n-1}$$

$$Q = mc_n(\text{T}_2 - \text{T}_1)$$

$$W_{12} = \int_1^2 Pdv$$



$$Q - W + \sum m_g\left(h_g + \frac{v_g^2}{2} + g z_g\right) - \sum m_ç\left(h_ç + \frac{v_ç^2}{2} + g z_ç\right) = (m_2 v_2 - m_1 v_1)_{kh.}$$

$$\dot{Q} - \dot{W} + \sum \dot{m}_g\left(h_g + \frac{v_g^2}{2} + g z_g\right) - \sum \dot{m}_ç\left(h_ç + \frac{v_ç^2}{2} + g z_ç\right) = 0$$

$$\eta_{IM} = \frac{W_{net,çıkan}}{Q_{giren}}$$

$$\eta_{IM} = 1 - \frac{Q_{çıkan}}{Q_{giren}}$$

$$\eta_{IM,tr} = 1 - \frac{T_L}{T_H}$$

$$COP_{SM} = \frac{Q_L}{W_{net,giren}}$$

$$COP_{SM} = \frac{1}{\left(\frac{Q_H}{Q_L}\right) - 1}$$

$$COP_{SM,tr} = \frac{1}{\left(\frac{T_H}{T_L}\right) - 1}$$

$$COP_{IP} = \frac{Q_H}{W_{net,giren}}$$

$$COP_{IP} = \frac{1}{1 - \left(\frac{Q_L}{Q_H}\right)}$$

$$COP_{IP,tr} = \frac{1}{1 - \left(\frac{T_L}{T_H}\right)}$$

$$\oint \frac{\delta Q}{T} \leq 0$$

$$dS = \left(\frac{\delta Q}{T}\right)_{içten\ tr}$$

$$dS \geq \frac{\delta Q}{T}$$

$$= \frac{Q}{T} + \sum_{in} m_i s_i - \sum_{out} m_o s_o + S_{gen} =$$

$$s_2 - s_1 = \Delta S$$

$$T ds = du + P.dV$$

$$T ds = dh - v dP$$

Sıvılar, katılar

$$s_2 - s_1 = c_{ort} . \ln \frac{T_2}{T_1}$$

Mükemmel gazlar

$$s_2 - s_1 = c_{v,ort} . \ln \frac{T_2}{T_1} + R \ln \frac{V_2}{V_1}$$

$$s_2 - s_1 = c_{P,ort} . \ln \frac{T_2}{T_1} - R \ln \frac{P_2}{P_1}$$

$$S_g - S_ç + S_{üretim} = \Delta S_{sistem}$$

Açık sistem sürekli rejim

$$\Delta S_{top} = S_{ür} = \dot{m}_ç s_ç - \dot{m}_g s_g + \frac{Q_{çev}}{T_{çev}}$$

$$\eta_{Türbin} = \frac{W_{gerçek}}{W_{izantropik}}$$

$$\eta_{pompa} = \frac{W_{izantropik}}{W_{gerçek}}$$

$$\eta_{komp.} = \frac{W_{izantropik}}{W_{gerçek}}$$