

## FORMULAS

$PV = mRT$		<b>Adyabatik Proses</b> $PV^k = sbt(const.)$ $\frac{P_1}{P_2} = \left(\frac{V_2}{V_1}\right)^k$  $\frac{T_1}{T_2} = \left(\frac{V_2}{V_1}\right)^{k-1}$ $\frac{T_1}{T_2} = \left(\frac{P_1}{P_2}\right)^{\frac{k-1}{k}}$  $W_{12} = \frac{mR(T_1 - T_2)}{k-1}$ $= \frac{P_1V_1 - P_2V_2}{k-1}$
$\underbrace{E_{in} - E_{out}}_{\substack{\text{Net energy transfer} \\ \text{by heat, work, and mass}}} = \underbrace{\Delta E_{system}}_{\substack{\text{Change in internal, kinetic,} \\ \text{potential, etc., energies}}} \quad (\text{kJ})$	<b>Sabit Basınç Prosesi</b> (P=Constant)  $\frac{V_1}{V_2} = \frac{T_1}{T_2}$  $Q = \Delta H$ $W_{12} = P(V_2 - V_1)$ $= mR(T_2 - T_1)$	<b>Sabit Sıcaklık Prosesi</b> (T=constant)  $\frac{P_1}{P_2} = \frac{V_2}{V_1}$ $W_{12} = mRT \ln\left(\frac{V_2}{V_1}\right) = Q$
$Q - W = \Delta U + \Delta KE + \Delta PE \quad (\text{kJ})$		<b>Politropik Proses</b> $PV^n = sbt(const.)$ $\frac{P_1}{P_2} = \left(\frac{V_2}{V_1}\right)^n$ $c_n = c_v \left(\frac{n-k}{n-1}\right)$ $W_{12} = \frac{mR(T_1 - T_2)}{n-1}$ $= \frac{P_1V_1 - P_2V_2}{n-1}$  $Q = mc_n(T_2 - T_1)$
$\Delta u = u_2 - u_1 = \int_1^2 c_v(T) dT$ $\Delta h = h_2 - h_1 = \int_1^2 c_p(T) dT$ $h = u + Pv$		<b>Sabit Hacim Prosesi</b> (V=sbt=Constant)  $\frac{P_1}{P_2} = \frac{T_1}{T_2}$
$C_p = \frac{R \cdot k}{k-1}$	$C_v = \frac{R}{k-1}$	$c_p - c_v = R$  $k = \frac{c_p}{c_v}$
$\eta = \frac{W_{net}}{\sum Q_{giren}}$		
$z = \frac{v_{gerçek}}{v_{ideal}}$  $P_v = zRT$  $P_R = \frac{P}{P_{kr}}$  $T_R = \frac{T}{T_{kr}}$	$x = \frac{m_g}{m} \quad [\%]$ $m = m_f + m_g$ $0 < x < 1$ $v_A = v_f + x(v_g - v_f)$ $h_A = h_f + x(h_g - h_f)$	

$$Q - W + \sum m_g (h_g + \frac{v_g^2}{2} + gz_g) - \sum m_c (h_c + \frac{v_c^2}{2} + gz_c) = (m_2 u_2 - m_1 u_1)_{kh.}$$

$$\dot{Q} - \dot{W} + \sum \dot{m}_g (h_g + \frac{v_g^2}{2} + gz_g) - \sum \dot{m}_c (h_c + \frac{v_c^2}{2} + gz_c) = 0$$

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

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

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

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

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

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

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

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

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

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

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

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

$$\frac{\delta Q}{T} + \sum_{in} m_i s_i - \sum_{out} m_o s_o + S_{gen} = S_2 - S_1 = \Delta S$$

Sıvılar, katılar

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

Mükemmel gazlar

$$s_2 - s_1 = c_{v, ort} \cdot \ln \frac{T_2}{T_1} + R \ln \frac{v_2}{v_1}$$

$$s_2 - s_1 = c_{p, ort} \cdot \ln \frac{T_2}{T_1} - R \ln \frac{p_2}{p_1}$$

$$T ds = du + P \cdot dV \quad S_g - S_c + S_{iretim} = \Delta S_{sistem}$$

$$T ds = dh - v dp \quad \Delta S_{top} = S_{ur} = \dot{m}_c s_c - \dot{m}_g s_g + \frac{Q_{cev}}{T_{cev}}$$

$$\eta_{Türbin} = \frac{W_{gerçek}}{W_{izan tropik}}$$

$$\eta_{pompa} = \frac{W_{izan tropik}}{W_{gerçek}}$$

$$\eta_{komp.} = \frac{W_{izan tropik}}{W_{gerçek}}$$

