

BİRİM CETVELİ

1 hg = 746 watt = 736 watt = 0,9868 ps
1 joule = 10 ⁷ erg
1 kwh = 860 kcal = 3,6*10 ³ kj
1 kcal = 4,18 kj = 1,163*10 ⁻³ kwh
1 libre = 0,454 kg
1 galon = 3,7854 lt = 3,8 lt = 8,34 libre
1 Btu = 1 kwh = 1,055 kj/kwh 1 Btu/kwh = 1,055 kj/kwh
1 cubic foot = 1 ft ³ = 7,4805 galon = 0,02832 m ³
1 ft/sn = 0,6818 mph = 0,3048 m/sn
1 ft ³ /sn = 448,8 gal/dk = 0,02832 m ³ /sn
1 ft = 33 cm ≈ 30 cm = 0,3048 m = 12 inch
1 ft ³ ≈ 27000 cm ³
1 inch = 0,0833 ft = 2,54 cm
1 psi = pound/inch ² = 6896 N/m ²
γ = su yoğunluğu = 62,428 libre/ft ³ = po/ft ³ = 1000 kg/m ³
g = 9,81 m/sn ² = 31,2 ft/sn ²

$$S = \sqrt{3} * V * I$$

$$S = \frac{f_0 - f_n}{f_n}$$

Üreticiler için: $K = \frac{P}{f_n * S}$ $\Delta P = K * \Delta f$

Tüketiciler için: $K' = \frac{P}{f_n * S}$ $\Delta L = K' * \Delta f$

$$W = P * t$$

$$W = A = F = \int_0^{24} P(t) * dt \text{ (günlük)}$$

$$W = A = F = \int_0^{8760} P(t) * dt \text{ (yıllık)}$$

$$r = \frac{P_{min}}{P_p} \text{ (Tüketicinin yük değiştirme oranı)}$$

$$F_{max} = P_p * 24$$

$$P_0 = \frac{F}{24} = \frac{\int_0^{24} P(T) * dt}{24} \quad h = \frac{F}{P_p}$$

$$m = \frac{F}{F_{max}} = \frac{h}{24} = \frac{P_0}{P_p} \text{ (yükleme katsayısı)}$$

$$P_k = \sum_{i=1}^n P_i$$

$$g = \frac{P_p}{P_k} \text{ (Eş zamanlılık katsayısı)}$$

$$P_p = P_a \text{ (aydınlatma)} + P_k \text{ (kuvvet)}$$

$$P_a = \frac{a_n * n}{100} \text{ (aydınlatma gücü)}$$

r : rezerv katsayısı

$$P_i = i * P_p \quad P_y = y * P_p$$

$$P_s = P_p + P_i + P_y = P_p (1+i+y)$$

$$r < 1 \quad P_s = (1+r) * P_p \quad r > 1 \quad P_s = r * P_p$$

$$f = \frac{M}{A} = \frac{M_{\ddot{u}} + M_t}{A} = \frac{TL}{kwh}$$

$$M = M_t + M_{\ddot{u}}$$

$$M_t = p (\%) * S \text{ (sermaye)}$$

$$p = p_f + p_a + p_t + p_i \quad S = a * P_s$$

$$b = b_{yakıt} + b_{k\ddot{u}l} + b_{yağ} + b_{su} \text{ (yakıt rüzgarda, su, güneş=0)}$$

$$b = b_y (1 + \alpha + \beta + \gamma)$$

ihmal

$$M_{\ddot{u}} (TL) = b_y (TL / kWh) * A (kwh)$$

$$b_y = Q_y * f_y \quad b_y = \frac{860}{n * H_u} * f_y$$

$$M_{\ddot{u}} (TL) = \frac{860}{n * H_u} * f_y * A$$

$$f = \frac{a * p}{h} + \frac{860}{n * H_u} * f_y$$

$$f_{ort} = \frac{f_1 * A_1 + f_2 * A_2 + f_3 * A_3}{A_1 + A_2 + A_3}$$

$$n_t = \frac{W}{Q_h} = \frac{Q_H - Q_C}{Q_H} = 1 - \frac{Q_C}{Q_H} \quad \Delta S = \frac{Q}{T}$$

$$K = ^\circ C + 273,15 \quad R = ^\circ F + 459,67$$

$$^\circ C = \frac{5}{9} (^\circ F - 32)$$

$$n_{max} = 1 - \frac{T_C}{T_H}$$

$$\text{Isı oranı} = \frac{3412 \text{ Btu/kwh}}{n} = \frac{3600 \text{ kj/kwh}}{n}$$

$$Q = m * c * \Delta T$$

$$CF = KF = \frac{h}{8760} = \frac{P_0}{P_p}$$

$$n_t (\ddot{U}ID) = n_t (AID) * \frac{AID}{\ddot{U}ID}$$

$$r = \frac{\text{yıllık tasarruf}}{\text{ilk yatırım maliyeti}}$$

$$\text{Amorti yılı} = \frac{1}{r} \quad \begin{matrix} \nearrow \text{m veya ft} \\ \searrow \text{N/m}^2 \end{matrix}$$

$$\sum W = z + \frac{P}{\gamma} + \frac{\vartheta^2}{2g} \quad \begin{matrix} \nearrow \text{(m/sn)}^2 \text{ veya} \\ \searrow \text{(ft/sn)}^2 \end{matrix}$$

$$\text{Basınç enerjisi} = \frac{P}{\gamma}$$

$$\text{Kinetik enerji} = \frac{\vartheta^2}{2g}$$

$$\pi * r^2 = \pi * \frac{D^2}{4}$$

$$\text{Hız} = \text{debi} = Q = V(\text{m/sn}) * A \text{ (borunun alanı)}$$

$$P = \gamma * Q * H$$

$$P(\text{kW}) = 9,8 * e * Q \left(\frac{\text{m}^3}{\text{sn}} \right) * H(\text{m})$$

$$P(W) = \frac{e * Q \left(\frac{\text{gal}}{\text{dk}} \right) * H(\text{ft})}{5,3}$$

Verim %50 alınırsa:

$$P(W) \cong \frac{Q \left(\frac{\text{gal}}{\text{dk}} \right) * H(\text{ft})}{10} \text{ (max güç)}$$

$$P(\text{kW}) \cong 5 * Q \left(\frac{\text{m}^3}{\text{sn}} \right) * H(\text{m})$$

$$\Delta H = k * Q^2 \text{ alınırsa : } P = C * Q * H_N$$

$$\Delta H = \frac{H_G}{3} \text{ (max güç için)}$$

$$\left. \begin{array}{l} Q = 1,8 * (W - 0,2h) h^{3/2} \\ Q = 2,9 * (W - 0,2h) h^{3/2} \end{array} \right\} \text{ m}^3/\text{s}$$

$$\text{Türbin girişi : } H_1 = z_1 + \frac{P_1}{\gamma} + \frac{C_1^2}{2g}$$

$$\text{Türbin çıkışı : } H_2 = z_2 + \frac{P_2}{\gamma} + \frac{C_2^2}{2g}$$

$$n_t = \frac{N_e}{N_0}$$

$$N_0 = \frac{\gamma * Q * H_0}{75} \quad N_0' = \frac{\gamma * Q' * H_0}{75}$$

$$N_e = \frac{\gamma * Q * H_0}{75} * n_t$$

$$n_k = \frac{Q'}{Q} \quad n_m = \frac{N_e'}{N_e} \quad n_h = \frac{N_e'}{N_0'}$$

$$n_t = n_m * n_h * n_k$$

$$n_s = \frac{n * \sqrt{N_e}}{H_0^{5/4}}$$

$$n_s' = \frac{n * \sqrt{N_e'/z}}{H_0^{5/4}} = \frac{n_s}{\sqrt{z}}$$

$$n = \frac{Q}{\frac{\pi * D_0^2}{4} * \sqrt{2 * g * H_0}}$$

$$\text{Kinetik enerji} = \frac{1}{2} * m * \vartheta^2$$

$$P_w = \frac{1}{2} * \rho * A * \vartheta^3 \quad A = \frac{\pi * D^2}{4}$$

$$\text{Vawt'larda } A = \frac{2}{3} * D * H$$

$$P * V = n * R * T \quad \frac{n}{V} = \frac{P}{R * T}$$

$$\rho = \frac{n(\text{mol}) * \text{moleküler weight}(\text{mol/gr})}{V(\text{m}^3) * 10^3(\text{gr/kg})}$$

$$\rho = \frac{P * MW}{R * T * 10^3} \quad R = 8,2056 * 10^{-5}$$

Havanın MW: 28,97 gr/mol

$$\text{KT(yoğ. oranı)} = \frac{\text{Herhangi bir sıcaklıktaki yoğunluk}}{15^\circ\text{C deki yoğunluk}(1,225 \text{ kg/m}^3)}$$

$$dz' \text{deki ağırlık} = g * \rho * A * dz$$

$$dP = P(z + dz) - P(z) = -g * \rho * dz$$

$$\frac{dP}{dz} = -g * \rho = -1,185 * 10^{-4} * P$$

$$P = P_0 * e^{-1,185 * 10^{-4} * H} \quad \text{KA} = \frac{P}{P_0} \text{ (yük. oranı)}$$

$$\frac{\vartheta}{\vartheta_0} = \left(\frac{H}{H_0} \right)^\alpha \text{ (Amerikan sistemi)}$$

$$\frac{\vartheta}{\vartheta_0} = \frac{\ln(H/z)}{\ln(H_0/z)} \text{ (Avrupa sistemi)}$$

$$P_b = \frac{1}{2} * m * (\vartheta^2 - \vartheta_d^2) \quad m = \rho * A * \vartheta_b$$

$$\vartheta_b = \frac{\vartheta + \vartheta_d}{2}$$

$$P_b = \frac{1}{2} * \rho * A * \underbrace{\left(\frac{\vartheta + \vartheta_d}{2} \right)}_m (\vartheta^2 - \vartheta_d^2) \quad \lambda = \frac{\vartheta_d}{\vartheta} \text{ olsun.}$$

$$P_b = \frac{1}{2} * \rho * A * \vartheta^3 * \left[\frac{1}{2} (1 + \lambda)(1 - \lambda^2) \right]$$

P_b nin max olması için C_p nin λ ya göre türevinin sıfır olması gerek.

$$\text{TSR} = \frac{\text{rotor hızı}(\text{dev/dk}) * \pi * D}{60 * \vartheta}$$

$$\text{TS} = \frac{\text{rotor hızı} * \pi * D}{60} \quad \text{Gear ratio (vites kut. oranı)} = \frac{\text{rpm}}{\text{rotor hızı}}$$