

(11)

Rankine

$$P_1 = P_2 = 7 \text{ MPa}$$

$$T_2 = 773 \text{ K}$$

$$P_4 = P_3 = 0,9 \text{ MPa}$$

$$T_4 = 450 + 273 \text{ K}$$

$$P_6 = P_5 = 10 \text{ kPa}$$

$$h_2 = 3411 \text{ kJ/kg}$$

$$h_3 = 2856 \text{ kJ/kg}$$

$$h_4 = 3372 \text{ kJ/kg}$$

$$h_5 = 2431 \text{ kJ/kg}$$

$$h_6 = 192 \text{ kJ/kg}$$

a) termički stupanj objekovanija

$$\eta_t = \frac{(h_2 - h_3) + (h_4 - h_5) - (h_6 - h_1)}{(h_2 - h_1) + (h_5 - h_3)} = \underline{\underline{0,3994}} \quad h_1 = h_6 + w_p$$

b) porast temperature rashladne vode

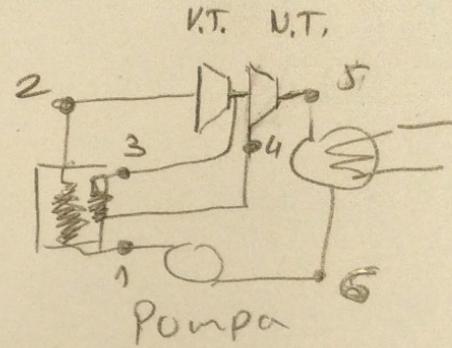
$$\dot{m} = 20000 \text{ kg/s}$$

$$c_v = 4,18 \text{ kJ/kg K}$$

$$Q = m c_v \Delta T$$

$$\Delta T = \frac{Q}{\dot{m} c_v} = \frac{h_5 - h_6}{\dot{m} c_v} = 8,035 \cdot 10^{-5} \text{ K}$$

↳ sumnjivo



$$s = 1000 \text{ kg/m}^3$$

$$\dot{m} = 300 \text{ kg/s}$$

(12)

3 rashladue petlye

$$P_j = 3 \text{ GW}$$

$$M_{UO_2} = 80 \text{ t}$$

$$\phi_{\text{neutron}} = 3 \cdot 10^{13} \text{ n/cm}^2\text{s}$$

$$G = 580 \cdot 10^{-28} \text{ m}^2$$

$$\dot{m}_{\text{nadioca}} = 5000 \text{ kg/s}$$

$$c_v = 5,7 \text{ kJ/kgK}$$

$$\rho = 720 \text{ kg/m}^3$$

$$T_{\text{ul}} = 568 \text{ K}$$

$$h_{\text{potne}} = 391 \text{ kJ/kg}$$

$$h_{\text{zasilicne}} = 2764 \text{ kJ/kg}$$

$$\dot{m}_{\text{turbina}} = 1269 \text{ kg/s}$$

pure

a) obogađenje goriva

$$\varphi = \frac{e = P \cdot m_{U-235}}{200 \cdot 1.6 \cdot 10^{13}}$$

$$c_v = 18 \text{ J/kgK}$$

$$P_{s2} = ?$$

$$R = 287 \text{ J/kgK}$$

$$P_1 = 5 \cdot 10^5 \text{ Pa}$$

$$c_p = c_v + R$$

$$T_1 = 473 \text{ K}$$

$$P_2 = 10^5 \text{ Pa}$$

$$T_2 = 373 \text{ K}$$

$$\Delta h = c_p \Delta T$$

$$c_{v1} = 30 \text{ m/s}$$

$$= -100.5 \text{ kJ/kg}$$

$$c_{l2} = 200 \text{ m/s}$$

$$z_{v1} = 5 \text{ m}$$

$$z_{l2} = 90 \text{ m/s}$$

$$m = 10 \text{ kg/s}$$

$$\Delta U = c_v \Delta T = 71.8 \text{ kJ/kg}$$

$$-g_{12} + h_1 + \frac{c_1^2}{2} + g z_1^2 = W_{t12} + h_2 + \frac{c_2^2}{2} + g z_2^2$$

$$W_{t12} = 109304.75 \text{ J/kg}$$

$$W_t = 171.2 \text{ kJ/kg}$$

$$P = W \cdot m = 1712 \text{ kW}$$

$$\begin{aligned}
 m_1 &= 500 \text{ kg} & c_{\text{ve}} &= 460 \text{ J/kg/K} \\
 T_1 &= 393 \text{ K} & T_{\text{OK}} &= 293,15 \\
 m_2 &= 250 \text{ kg} \\
 T_2 &= 291 \text{ K}
 \end{aligned}$$

a) $T_{\text{konačno}}$

$$U_2 - U_1 \approx 0$$

$$U_1 = m_1 T_1 c_1 + m_2 c_{\text{q}} T_2$$

$$U_2 = m_1 T_1' c_1 + m_2 c_{\text{q}} T_1'$$

$$T_1' (m_1 c_1 + m_2 c_2) = \overbrace{m_1 T_1 c_1 + m_2 c_1 T_2}$$

$$\underbrace{T_{\text{konačno}}}_{=} = 359 \text{ K}$$

b) Promjena entropije

$$\begin{aligned}
 \Delta S &= \frac{\partial}{\partial T} m_1 c \ln \frac{T_{\text{K}}}{T_1} + m_2 c \ln \frac{T_{\text{K}}}{T_2} \\
 &= 3337,84 \text{ J/K}
 \end{aligned}$$

$$(15) h_{\text{zalvata}} = 200 \text{ m}$$

$$h_{\text{turbine}} = 50 \text{ m},$$

$$h_{\text{vode}} = 40 \text{ m}$$

$$h_{\text{odvodnog}} = 45 \text{ m}$$

$$Q_{\text{ust}} = 150 \text{ m}^3/\text{s}$$

$$\eta = 0,85$$

$$r_{1/2} = 3 \text{ m}$$

b) difuzor sa polupijerom za 1 m u crtežu

$$A_t = \frac{(r_{1/2})^2 \pi}{4} = 12,56 \text{ m}^2$$

$$c_d = \frac{Q_a}{A_t} = \frac{150}{12,56} = 11,93 \text{ m/s}$$

$$H_{\text{netto}} = h_{\text{zalvata}} + h_{\text{vode}} - h_{\text{odv}} - \frac{c_d^2}{2g} = 187,44 \text{ m}$$

$$P = 9,81 \cdot 3 \cdot Q \cdot H_{\text{netto}} \cdot \eta = 234,8 \text{ MW}$$

a) sa aspiratorom

- ne znam - vjerojatno nesu
netto visinom se mijenja

c) godisnu proizvedenu en $m = 0,7$

(zab) $W = m \cdot T \cdot P = 5183,26 \text{ TWs}$

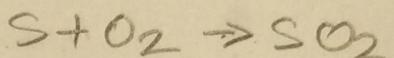
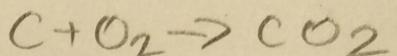
$$⑯ \quad H = 26 \text{ MJ/kg}$$

$$w = \frac{1}{s}$$

$$m_C = 0.65 \text{ mol}$$

$$m_{\text{sum}} = 0.03 \text{ mol}$$

$$\gamma = 0.33 \%$$



$$W = 1 \text{ kWh} = \frac{H \cdot m}{10^6}$$

$$1 \text{ kWh} = 3,6 \cdot 10^6 \text{ J}$$

$$m = \frac{3,6 \cdot 10^6}{y \cdot 26 \text{ MJ/kg}}$$

$$= 0,42 \text{ kg}$$

$$C \rightarrow 12 \text{ g/mol}$$

$$S \rightarrow 32 \text{ g/mol}$$

$$O_2 \rightarrow 16 \text{ g/mol}$$

$$1 \text{ kg C} \rightarrow \frac{32}{12} \text{ O}_2$$

$$m_C = m \cdot 0.65 = 0.273 \text{ kg}$$

$$m_S = m \cdot 0.03 = 0.0126 \text{ kg}$$

$$m_{CO_2} = m_C + m_{O_2} = 1,001 \text{ kg}$$

$$m_{SO_2} = 2 \cdot 0.026 = 0.052 \text{ kg}$$

(17)

$$y = 0,32$$

$$m = 35 \quad t/h$$

a)

$$m = 1 \text{ kg}$$

$$Q = 9 \text{ MJ}$$

$$P = ?$$

$$P_t = \frac{35\,000}{\textcircled{3600} \text{ Sekunde}} \cdot Q = 87,5 \text{ MW}$$

$$P_e = y \cdot P_t = 28,875 \text{ MJ}$$

b)

$$m = 0,75$$

$$\text{Prinzip} = \frac{12 \text{ kg}}{10 \text{ m}^2} = 1,2 \text{ kg/m}^2$$

$$0,75 \cdot (365 \cdot 24 \cdot 3600) P_e = W_{\text{stvarno}}$$

$$W_{\text{stv}} = 682,95 \text{ TWs}$$

$$m = \frac{W_{\text{stv}}}{Q} = 75,88 \cdot 10^6 / 0,33 = 229,95 \cdot 10^6$$

$$S = \frac{m}{\text{Prinzip}} = 19,16 \cdot 10^3 \text{ ha}$$

$$⑯ \quad C_{n1} = 8 \text{ m/s} \quad d = 40 \text{ m}$$

$$C_{n2} = 10 \text{ m/s} \quad d = 50 \text{ m}$$

$$C_{min} = 5 \text{ m/s}$$

$$C_{max} = 2 C_n$$

$$\beta = 1,225 \text{ kg/m}^3$$

$$A = \frac{d^2}{4} \pi$$

a) godišnja proizvodnja el. en.

$$\gamma = 0,5$$

$$V_{pros} = 8,63 \text{ m/s}$$

$$P = \gamma \cdot C_p \cdot 0,5 \cdot \beta \cdot A \cdot V^3$$

jetar pros

$$P_1 = 132,647 \text{ kW}$$

$$P_2 = 63,633 \text{ kW}$$

$$W_1 = 285,98 \text{ MWh}$$

$$W_2 = 557,42 \text{ MWh}$$

b)

$$m_1 = \frac{W_{stvarno}}{T_{prom} \cdot P_{max}} = 0,035$$

$$m_2 = 0,011$$

$$19. \quad P_{\max} = 1200 \text{ MW}$$

$$P_{\min} = 800 \text{ MW}$$

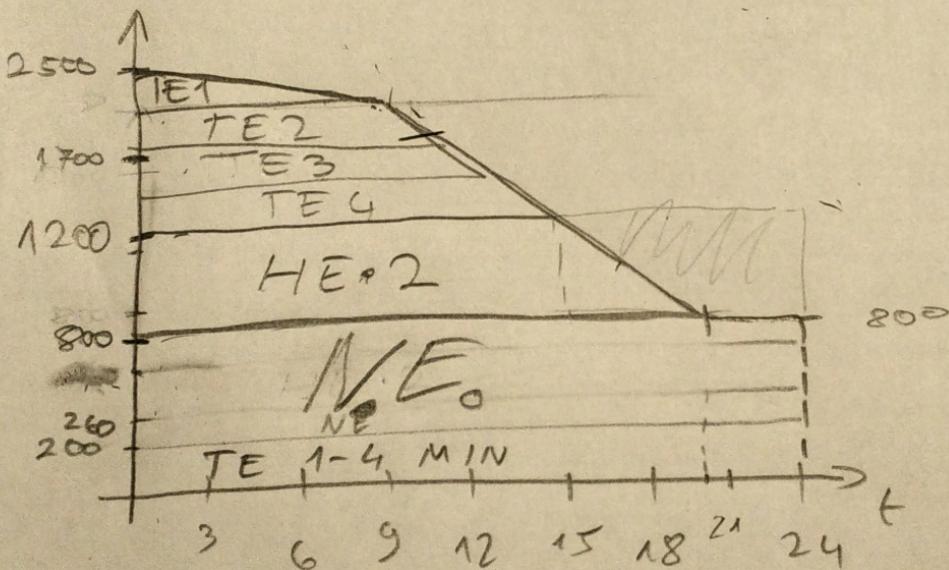
$$t_{P_{\min}} = 4 \text{ h}$$

$$P_{NE} = 600 \text{ MW}$$

$$2. \quad P_{HE} = 200 \text{ MW}$$

$$4. \quad P_{TE} = 250 \text{ MW}$$

$$4. \quad P_{TE \min} = 50 \text{ MW}$$



$$b) \quad m = \frac{W_{stv}}{24 \cdot P_{\max}} = \frac{\text{površina ispod grafra}}{24 \cdot 2200 \cdot 10^6}$$

$$c) \quad W = 7.05 \text{ GWh}$$

- površina za samo TE2

$$d) \quad W_{pp} = 4(4 \cdot 400 + \frac{1}{2} 5 \cdot 400) = 2600 \text{ MW}$$