Auditorne - vježba za ZI 16.6.2016.

① $p_1 = p_2 = 9\,MPa$ $\vartheta_2 = 500°C \rightarrow T_2 = 773,15\,K$

$p_3 = p_4 = 0,9\,MPa$ $\vartheta_4 = 450°C \rightarrow T_4 = 723,15\,K$

$p_5 = p_6 = 10\,kPa$ $\rho = 10^3\,kg/m^3$

$h_2 = 3411\,kJ/kg$ $\dot{m}_i = 300\,kg/s$

$h_3 = 2850\,kJ/kg$ $\dot{m}_{HV} = 23\,000\,kg/s$

$h_4 = 3372\,kJ/kg$ $\eta_t, \Delta T_{HV} = ?$

$h_5 = 2431\,kJ/kg$

$h_6 = 192\,kJ/kg$

$\eta_t = \dfrac{W}{q_{dov}} = \dfrac{W_{VT} + W_{NST} - W_p}{q_{dov1} + q_{dov2}} = \dfrac{W_{23} + W_{45} - V\cdot\Delta p}{q_{12} + q_{34}} =$
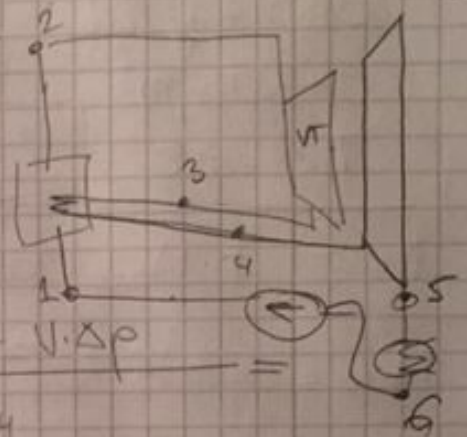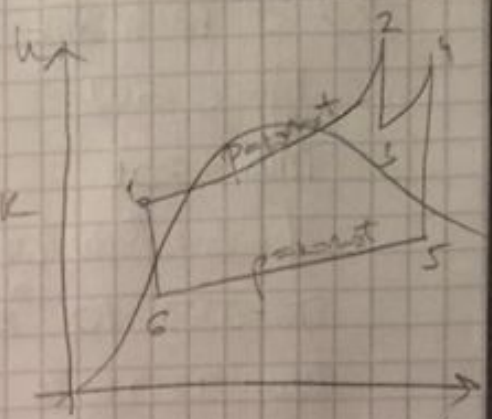
$= \dfrac{h_2 - h_3 + h_4 - h_5 - V(p_1 - p_6)}{h_2 - h_1 + h_4 - h_3} - \left[V = \dfrac{1}{\rho} \right] = 0,3894$

$W_p = h_1 - h_6$

$V\cdot\Delta p = h_1 - h_6 \rightarrow h_1 = \Delta p \cdot V + h_6$

$\dot{m}_{HV} \cdot c_v \cdot \Delta T = \dot{m}_i \cdot \Delta h_{kond}$

$\Delta T = \dfrac{\dot{m}_i \cdot \Delta h_{kond}}{c_v \cdot \dot{m}_{HV}} = 8035\,K$

×realni proces $\eta_{it} = \dfrac{W_{real}}{W_{id}}$

② 3 reaktoùre potlje $h_{we_1} = 981\ kJ/kg$

$P_j = 3\ GW$ $h_{2p} = 2964\ kg/kg$

$m_{u_{02}} = 20\ t$ $\dot{m}_{u_s} = 1203\ kg/s$

$\Phi = 3 \cdot 10^{13}\ u/cm^2 s$ $e, T_{iz}, P_f, \Delta p_p = ?$

$\sigma = 580 \cdot 10^{-22}\ m^2$ $\boxed{T_{iz} = ?}$

$m_p = 5000\ kg/s$

$c_i = 5.7\ kJ/kgK$

$\rho = 720 g/m^3$

$T_{we} = 235°C$
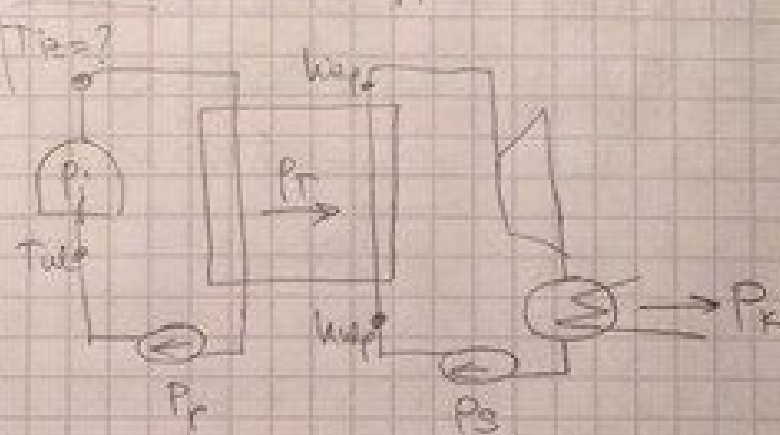
$P_j = \sigma \cdot \Phi \cdot N_{235} \cdot 200 \cdot 1.6 \cdot 10^{-13}$

$N_{235} = 5.388 \cdot 10^{27} = e \cdot m_{u_{02}} \cdot \dfrac{232}{270} \cdot \dfrac{N_A}{235} \rightarrow e = 0.0298$

$P_j = \dot{m} \cdot c_i \cdot \Delta T \rightarrow \Delta T = \dfrac{P_j}{\dot{}}$ $\dfrac{P_j}{3 \cdot 5000 \cdot 5700} = 35.09 K$

$T_{iz} = 330°C\ (603 K)$
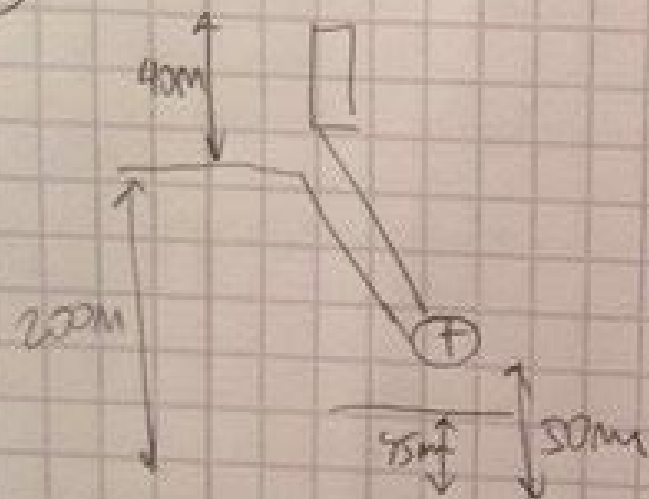
$P_T = \dot{m}_{we} \Delta h = P_j + 3 P_p = 3011,30 MW$

$P_p = 3,78\ MW$

$P_p = \dot{m} \cdot w_p = \dot{m} \cdot V \cdot \Delta p_p = \dot{m} \cdot \dfrac{1}{\rho} \cdot \Delta p \Rightarrow \Delta p_p = 547,2 kPa$

$$P_P = 3{,}78 \ MW$$

$$P_P = \overset{.}{m} \cdot W_P = \overset{.}{m} \cdot V \cdot \Delta p_P = \overset{.}{m} \cdot \frac{1}{\rho} \cdot \Delta p \Rightarrow \Delta p_P = 544{,}2 \ kPa$$

③

$$H_Z = 200m \quad H_B = 40m \qquad M = 0{,}7$$

$$H_T = 50m \qquad H_{DV} = 45m$$

$$Q = 150 \, m^3/s \quad \eta = 0{,}85$$

$$D_t = 3m \qquad D_D = 5m$$

$$P_A, \ P_D, \ W_A, \ W_D = ?$$

$$P = \rho \, g \, H_n \cdot \eta \, Q$$

$$H_A = H_Z + H_B - H_t - \frac{c_A^2}{2g}$$

$$c_A = \frac{Q}{A_A} = \frac{Q}{\left(\frac{D_t}{2}\right)^2 \cdot \pi}$$

$$H_D = H_Z + H_B - H_{DV} - \frac{c_D^2}{2g}$$

$$c_D = \frac{Q}{A_D} = \frac{Q}{\left(\frac{D_D}{2}\right)^2 \pi}$$

$C_i = 21.22 \, m/s$ $H_A = 172 m$ $H_D = 192 m$

$C_0 = 7.633 \, m/s$ $P_A = 215,2 MW$ $P_D = 243,2 MW$

$W_A = P_A \cdot 8760 m$ $W_D = 1492,36 Wh$

$= 1319,6 GWh$

4)

m/s	0	6	8	10	16	20	25
$x \, \text{g/m}^3$	15	38	26	9	5	2	12

$\rightarrow$ 2 agregato : VA1 : $V_n = 8 m/s$ VA2: 10 m/s

$D_r = 40 M$ $D = 30 m$

$\underline{\rho = 1.225 \, kg/m^3}$ $C_E = 0,5$

$W, W = ?$

$P = \frac{1}{2} \rho A C_P V^3$

$P_5 = \frac{1}{2} \rho \left(\frac{D}{2}\right)^2 \cdot \pi \, C_{P_E} \cdot V^3 \rightarrow P_{51} = 98,1 \, kW$

$P_{52} = 25,2 \, kW$

$P_8 \Rightarrow P_{8A} - P_n = 197 \, kW = P_b - P_c \quad \leftarrow VA1$

$P_{82} = 307,3 \, kW \leftarrow VA2$

$P_{15} - P_n = P_{16} - P_{20} = 601,3 \, kW \leftarrow VA2$

$W_{VA_1} = 8760 (x \cdot P_5 + y \cdot P_n) = 8760 (0.33 \cdot P_5 + 0.33 P_n) = 934,8 \, MWh$

$W_{VA_2} = 8760 (x \cdot P_5 + y \cdot P_8 + z \cdot P_n) = 1656,1 \, MWh$

          $\uparrow$ $\uparrow$

         0.26   0.14