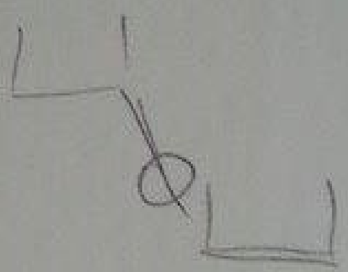
$Q_v = 300\ m^3/s$

$R_{gv} = \frac{Q}{...}$ $H_{gv} = 30\ m$

LJIR 2015



andom Ep

$$E_p = \frac{E_{el}}{\eta_{el}} = \rho V g H$$

$$\eta_{el} = \frac{E_{el}}{E_p} = \frac{E_{el}}{\rho V g H}$$

$$\eta_p = \frac{E_p}{E_{el\,vanjsko}}$$

$$E_p = mgH = \rho V g H = 9810 \cdot 300 \cdot 700 \cdot 10^3$$

$$E_p = 2{,}06 \cdot 10^{12}\ J = 572{,}25\ MWh$$

$$\eta_{el} = \frac{500}{572{,}25} = 0{,}874$$

$$\eta_p = \frac{E_p}{E_{el\,vanj}} = \frac{572{,}25}{900} = 0{,}636$$

Sunce – solarna el. sa dvoosnim rotacijom – auditorne slične

$$P = 1000\ W/m^2 \cdot 1 \cdot 10^6\ m^2 \cdot 0{,}45 \cdot 0{,}42 \cdot 0{,}85 = 160{,}65\ MW$$

$$W = 1600\ \frac{kWh}{m^2} \cdot 10^6\ m^2 \cdot 0{,}45 \cdot 0{,}42 \cdot 1{,}2 \cdot 0{,}85 = 308{,}45\ GWh$$

$$m = \frac{308{,}45 \cdot 10^3}{160{,}65 \cdot 8760} = 0{,}219$$

$$P = \frac{1}{2} \rho A v^3 \cdot c_p \qquad c_p = \frac{2P}{\rho A v^3} = \frac{2 \cdot 0{,}7 \cdot 10^6}{1{,}225 \cdot 8^3 \frac{80^2 \pi}{4}} = 0{,}444$$

$$W = 8760 \cdot (0{,}7 \cdot 0{,}4 + 1{,}5 \cdot 0{,}13) = 4161\ MWh$$

$$m = \frac{4161}{8760 \cdot 1{,}5} = 0{,}3167$$

IIjiR 8.7. 2015.

4\. p_{H} na vrhu $= 6\cdot10^3\cdot 9,8$

$\Delta p = \frac{6\cdot10^3\cdot9,8}{80\cdot[illegible]} = 67,5$ kPa $\rightarrow p_{H} = 67,5+6$

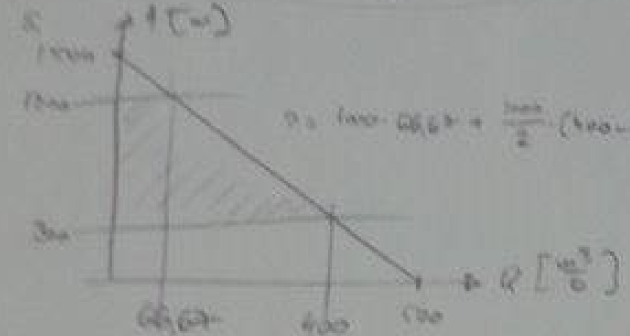
$p_{H} = 73,5$ kPa

$W = mgh$

$\Delta w = gh = 9,81\cdot2 = 19,62$ J/kg $\Delta P = 19,62\cdot80 = 1,57$ kW

$\Delta P_{pumpe} = \frac{1,57}{0,9} = 1,744$ kW $P_{motora} = 7,744$ kW

5\.



$Q = 500 - \frac{H}{3}$

$H = 3(500 - Q)$

$V = 100\cdot66,67 + \frac{1200}{2}\cdot(400 - 66,67) = 233\,335$ m^4/s

$$W = 8760\cdot P = 8760\cdot\rho g \int_{300}^{1300} Q\,dH =$$

$$= 8760\,\rho g\,\frac{1}{3}\left(1500H - \frac{H^2}{2}\right)_{300}^{1300} = 20,052 \text{ TWh}$$

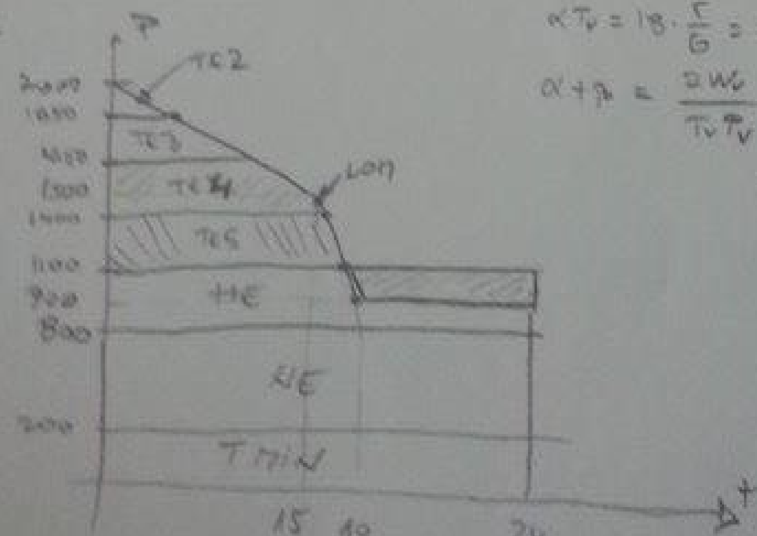
(ρ = 5810; the bracketed term $= 233\,333$ $\frac{m^4}{s}$)

$20,052$ TWh $= 7,22\cdot10^{16}$ J

$Q = \frac{1}{3}(1500 - 400) = 366,67$ $\frac{m^3}{s}$ $H_{GV} = \frac{366,67}{10} = 36,67$ m $H_{DV} = \frac{366,67}{50} = 7,33$ m $H_n = H_{GV} - H_{DV} = 29,34$ m

$P = \rho g Q H \eta = 5810\cdot300\cdot29,34\cdot0,9 = 77,7$ MW

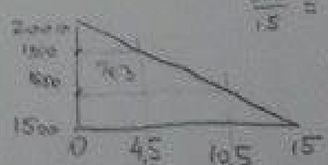
6\.



$\alpha T_v = 18\cdot\frac{5}{6} = 15$ h

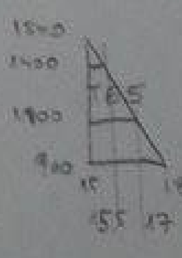
$\alpha + \beta = \frac{2W_v}{T_v P_v} = \frac{2\cdot13650}{18\cdot1100} \Rightarrow \beta = 0,54545$

$T_0 P_v = 600$ MW



$\frac{500}{15} = \frac{150}{x}$ $x = 4,5$

$\frac{500}{15} = \frac{350}{x}$ $x = [illegible]$



$\frac{600}{3} = \frac{100}{x}$ $y = 15,[illegible]$

$\frac{600}{3} = \frac{400}{x}$ $y = 17$

$T_{MREŽU} = 6\times200 + 1\cdot\frac{200}{2} = 1300$ MWh

TE1 : 0 MWh

TE3 : $24\cdot50 + 200\cdot4,5 + \frac{200\cdot6}{2} = 2700$ MWh

TE5 : $24\cdot50 + 300\cdot15,5 + \frac{300\cdot1,5}{2} = 6075$ MWh

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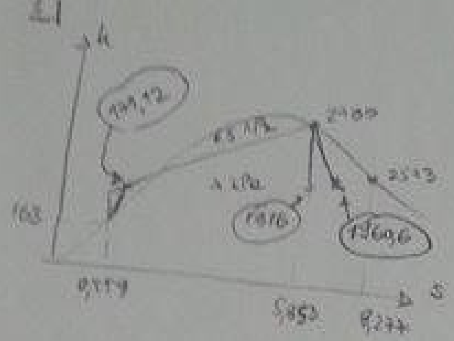
1.)



$x_{id} = \frac{5,853 - 0,559}{8,277 - 0,559} = 0,6859$

$h = 163 + 0,6859(2573 - 163) = 1816$ kJ/kg

$w_{t,id} = 2780 - 1816 = 964$ kJ/kg

$w_{treal} = 964 \cdot 0,85 = 819,4$ kJ/kg

$h_{real} = 2780 - 819,4 = 1960,6$ kJ/kg

$x_{real} = \frac{1960,6 - 163}{2573 - 163} = 0,746$ NE

$q_{dov} = 2780 - 171,12 = 2608,9$ kJ/kg

$P_T = w_T \cdot \dot{m} = 819,4 \cdot 1050 = 860,4$ MW

$P_{TG} = q_{dov} \cdot \dot{m} = 2608,9 \cdot 1050 = 2739,3$ MW

$w_{p,id} = 0,001 \cdot (65 \cdot 10^6 - 4 \cdot 10^3) = 6,193$ kJ/kg

$w_{preal} = \frac{6,193}{0,8} = 8,116$ kJ/kg

$h_1 = 163 + 8,116 = 171,12$ kJ/kg

$\eta_t = \frac{819,4 - 8,116}{2608,9} = 0,311$

2.)

$P_T = P_j + nP_{pump} = \Delta h_{SOZ} \cdot \dot{m}_{turb} = (2760 - 650) \cdot 10^3 \cdot 475 \cdot 4 = 4009$ MW

$4009 = 3990 + 4 \cdot P_p \rightarrow P_p = 4,75$ MW

$P_j = N \sigma \phi \cdot 200 \cdot 1,6 \cdot 10^{-13}$

$N = \frac{3990 \cdot 10^6}{3 \cdot 10^{17} \cdot 580 \cdot 10^{-28} \cdot 200 \cdot 1,6 \cdot 10^{-13}} = 7,166 \cdot 10^{27}$

$N = e \cdot m_{UO_2} \cdot \frac{238}{270} \cdot \frac{6,022 \cdot 10^{26}}{235} \Rightarrow 0,0302 = e$

$P_j = \dot{m} c \Delta T$

$\dot{m} = \frac{3990 \cdot 10^6}{5,9 \cdot 10^3 \cdot (329 - 295)} = 19890 \frac{kg}{sec}$ $\quad \dot{m}_{pump} = \frac{19890}{4} = 4972,5 \frac{kg}{s}$

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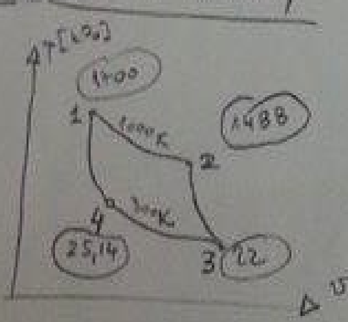

$\frac{p_1}{p_4} = \left(\frac{T_1}{T_4}\right)^{k/k-1}$ $\quad 1,4/0,4 = 3,5$ $\quad = \left(\frac{1000}{300}\right)^{3,5} = 67,62 = \frac{p_2}{p_3}$

$p_4 = p_1 / 67,22 = 25,14$ kPa

$p_2 = p_3 \cdot 67,22 = 1487,64$ kPa

$q_{12} = RT \ln \frac{p_1}{p_2} = 0,287 \cdot 1000 \ln \frac{1700}{1487,64} = 38,3$ kJ/kg

$q_{34} = RT \ln \frac{p_3}{p_4} = 0,287 \cdot 300 \ln \frac{25,14}{22} = -11,48$ kJ/kg

$w = q_{12} + q_{34} = 26,81$ kJ/kg

za $m = 20$ kg: $Q_{12} = 766$ kJ

$Q_{34} = -229,8$ kJ

$W = 536,2$ kJ

$\eta = 1 - \frac{300}{1000} = 0,7 = \frac{26,81}{38,3} = 0,7$