ltro-energetski
dok spremnik

17

$W_{el} = 14\ \frac{m^3}{kg} \cdot 7000\ \frac{kg}{m^3} \cdot 0{,}32^{\eta} \cdot 5\,000\,000 \cdot \frac{1}{10\,000} \cdot 0{,}85$ | JIR 2014

$W_{el} = 1{,}3328 \cdot 10^{13}\ J = 3702\ MWh = 3{,}702\ GWh$

$P_{el} = \frac{W_{el}}{8760 \cdot 98} = 0{,}528\ MW$

$P = \frac{1}{2} \rho A v^3 \cdot \eta$

$8\ m/s$: $P_8 = \frac{1}{2} \cdot 1{,}225 \cdot \frac{D^2\pi}{4} \cdot 8^3 \cdot 0{,}5 = 0{,}308\ MW$

$11\ m/s$: $P_{11} = \frac{1}{2} \cdot 1{,}225 \cdot \frac{D^2\pi}{4} \cdot 11^3 \cdot 0{,}5 = 0{,}8\ MW$

$15\ m/s$: $P_{15} = 0{,}8\ MW$

mm/s < $96 \cdot 11 = 6{,}6\ m/s$; $16 \cdot 11 = 17{,}6\ m/s$

$W_{VA} = 8760 \cdot (0{,}2 \cdot 0{,}308 + 0{,}1 \cdot 0{,}8 + 0{,}04 \cdot 0{,}8) = 1521\ MWh$

10

$1\ VA$: $A_1 = 20 \cdot \frac{D^2\pi}{4} = 39270\ m^2$

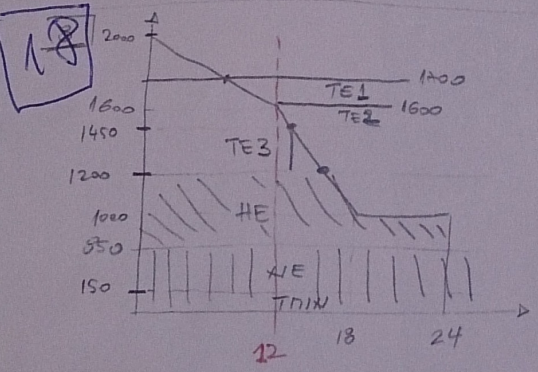
$x_{VA} = \frac{5\,000\,000}{39270} = 127{,}3$

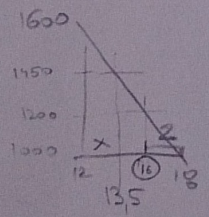
$W = 127{,}3 \cdot W_{VA} = 193{,}6\ GWh$ $\quad P = 127{,}3 \cdot P_{11} = 101{,}8\ MW$

$W = 1600\ \frac{kWh}{m^2} \cdot \frac{5 \cdot 10^6}{2}\ m^2 \cdot 1{,}22 \cdot 0{,}12 = 585{,}6\ GWh$

$P = 1000\ W/m^2 \cdot \frac{5 \cdot 10^6}{2}\ m^2 \cdot 0{,}12 = 300\ MW$

18





$\frac{150}{x} = \frac{600}{8}$

$x = 1{,}5$

$W_{TE3} = 24 \cdot 50 + 13{,}5 \cdot 200 + \frac{250 \cdot (16 - 13{,}5)}{2}$

$W_{TE3} = 4887{,}5\ MWh$

$P_V = 2000 - 1000 = 1000\ MW$

$\beta\ P_V = 0{,}6 \cdot 1000 = 600\ MW$

$\alpha + \beta = \frac{2W_V}{T_V P_V}$

8

$T_V = 18\ h$

$P_V = 1000\ MW$

$m = \frac{W}{24 \cdot 2000} \Rightarrow W = 35400$

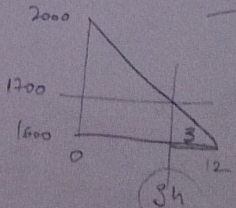
$W_V = 35400 - 24 \cdot 1000 = 11400\ MWh$

$\alpha + \beta = \frac{2 \cdot 11400}{18 \cdot 1000} = 1{,}266666$

$\alpha = 0{,}6666$

$\alpha\ T_V = 12\ h$

c) $T_{TE1} = 3\ h$



d) $W_{RH} = \frac{300 \cdot 3}{2} = 1350\ MWh$

STARITI ISPITI

JIR 2014

1]

$$q_{12} + h_1 + \frac{1}{2}c_1^2 + gz_1 = w_{t12} + h_2 + \frac{1}{2}c_2^2 + gz_2$$

$$w_{t12} = q_{12} + h_1 - h_2 + \frac{1}{2}(c_1^2 - c_2^2)$$

$$w_{t12} = q_{12} + c_p(T_1 - T_2) + \frac{1}{2}(c_1^2 - c_2^2)$$

$c_p(T_1 - T_2) = (718 + 287) \cdot 100 = 100\,500$ J/kg

$\frac{1}{2}(c_1^2 - c_2^2) = \frac{1}{2}(30^2 - 200^2) = -19550$ J/kg

$w_{t12} = -9000 + 100\,500 - 19\,550 = 71\,950$ J/kg

$P = w_{t12} \cdot \dot{m} = 71{,}95$ kJ/kg $\cdot$ 10 kg/s $= 719{,}5$ kW

2]

$$\Delta s_{pl} = c_v \ln\frac{T_2}{T_1} + R\ln\frac{V_2}{V_1} = c_p \ln\frac{T_2}{T_1} - R\ln\frac{p_2}{p_1}$$

$\Delta s_{pl} = 1005 \cdot \ln\frac{293}{273} = 71{,}054$ J/kgK | $\Delta S_{pl} = m \cdot \Delta s_{pl} = 5 \cdot 71{,}054 = 355{,}27$ J/K

$\Delta s_{ok} = \frac{q_{ok}}{T_{ok}}$ $\quad q_{ok} = -q_{12}$

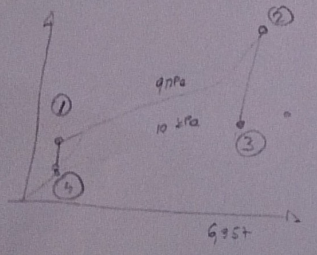
$q_{12} = c_p(T_2 - T_1) = 1005 \cdot 20 = 20\,100$ J/kg

$\Delta s_{ok} = \frac{-20100}{273} = -68{,}601$ J/kgK | $\Delta S_{ok} = 5 \cdot (-68{,}601) = -343$ J/K

$\Delta s_{uk} = \Delta s_{pl} + \Delta s_{ok} = 71{,}054 - 68{,}601 = 2{,}453$ J/kgK

$\Delta S_{uk} = 5 \cdot 2{,}453 = 12{,}27$ J/K > 0 NEPOVRATAN

3] IDEAL. PANK. SA ', " (JIR 2012)



$x = \frac{s - s'}{s'' - s'} = \frac{6{,}957 - 0{,}649}{8{,}151 - 0{,}649} = 0{,}841$

$h_3 = h' + x(h'' - h') = 191{,}8 + 0{,}841(2585 - 191{,}8) = 2204{,}5$ kJ/kg

$|w_{pl}| = 0{,}001 \cdot (9 \cdot 10^6 - 10 \cdot 10^3) = 8{,}99$ kJ/kg

$h_1 = 191{,}8 + 8{,}99 = 200{,}79$ kJ/kg

$w_t = h_2 - h_3 = 3631 - 2204{,}5 = 1426{,}5$ kJ/kg

$q_{dov} = h_2 - h_1 = 3631 - 200{,}79 = 3430{,}21$ kJ/kg

$\eta_t = \frac{w_t + |w_{pl}|}{q_{dov}} = \frac{1426{,}5 - 8{,}99}{3430{,}21} = 0{,}413$

$\dot{m} = \frac{P}{w_t} = \frac{400 \cdot 10^6}{1426{,}5 \cdot 10^3} = 280{,}4$ kg/sec

$\dot{m} c \Delta T = \dot{m} \Delta h_{kond}$

$\Delta T = \frac{\dot{m}\Delta h_{kond}}{\dot{m} c} = \frac{280{,}4 \cdot (2204{,}5 - 191{,}8) \cdot 10^3}{20\,000 \cdot 4180}$

$\Delta T = 6{,}75$ K

c) Koliko
d) Koliko ener

4 $P_V' = 241 \cdot (18^2 - 36) \cdot 3{,}75 \cdot 18{,}6 \cdot 10^3 = 4841{,}2$ MW

8 IQ 2014

$P_V' = \dot{m}_V' \cdot c \cdot \Delta T$

$\dot{m}_V' = \frac{P_V'}{c \Delta T} = \frac{4841{,}2 \cdot 10^6}{5{,}54 \cdot 10^3 \cdot 33} = 26481$ kg/sec

$\dot{m}_{pot} = \frac{\dot{m}_V'}{4} = 6620$ kg/sec

$\eta = \frac{P_{mech}}{P_T} = \frac{P_T - P_{PERD}}{P_T} = 1 - \frac{P_{perd}}{P_T} = 1 - \frac{3300}{4861{,}2} = 9321$

$P_T = P_V' + 4.5 = 4861{,}2$ MW

$P_V' = 200 \cdot 1{,}6 \cdot 10^{-13} \cdot N_{235} \cdot \sigma_f \cdot \phi$

$N_{235} = \frac{4841{,}2 \cdot 10^6}{200 \cdot 1{,}6 \cdot 10^{-13} \cdot 580 \cdot 10^{-28} \cdot 3 \cdot 10^{17}} = 8{,}675 \cdot 10^{27}$

$N_{235} = e \cdot m_{UO_2} \cdot \frac{238}{270} \cdot \frac{N_A}{235}$

$m_{UO_2} = \frac{N_{235}}{e} \cdot \frac{270}{238} \cdot \frac{235}{N_A} = \frac{8{,}675 \cdot 10^{27}}{0{,}03} \cdot \frac{270}{238} \cdot \frac{235}{6{,}022 \cdot 10^{26}} = 128{,}3$ tons

5 15

$Q = c \cdot A = 150$ m³/s

$A_1 = \frac{3^2\pi}{4} = 7{,}069$ m² $\quad c_1 = \frac{Q}{A_1} = \frac{4 \cdot 150}{3^2\pi} = 21{,}22$ m/s

$A_2 = \frac{5^2\pi}{4} = 19{,}635$ m² $\quad c_2 = \frac{Q}{A_2} = \frac{4 \cdot 150}{5^2\pi} = 7{,}64$ m/s

8

$A_1 = 200 + 40 - 45 - \frac{21{,}22^2}{2 \cdot 9{,}81} = 172{,}05$ m

22,75 m

$P_1 = \eta_g \rho Q H_N = 1000 \cdot 9{,}81 \cdot 150 \cdot 172{,}05 \cdot 0{,}85 = 215{,}2$ MW

$H_D = 200 + 40 - 45 - \frac{7{,}64^2}{2 \cdot 9{,}81} = 192{,}025$ m

2,925

$P_D = \eta_g \rho Q H_N = 1000 \cdot 9{,}81 \cdot 150 \cdot 192{,}025 \cdot 0{,}85 = 240{,}2$ MW

$W_A = 8760 \cdot 215{,}2 \cdot 0{,}7 = 1319{,}6$ GWh

$W_D = 8760 \cdot 240{,}2 \cdot 0{,}7 = 1472{,}9$ GWh

~~6~~

$W_{el} = P_{el} \cdot 8760 \cdot n$

$W_t = \frac{W_{el}}{\eta} = \frac{300 \cdot 10^6 \cdot 8760 \cdot 0{,}3}{0{,}42} \cdot 3600 = 6{,}7577 \cdot 10^{15}$ J

6

$V_{CH_4} = \frac{W_t}{H} = \frac{6{,}7577 \cdot 10^{15}}{34 \cdot 10^6} = 1{,}9876 \cdot 10^8$ m³

$V_{CO_2} = V_{CH_4} = m_{CO_2} \frac{V_M}{M}$ $\quad m_{CO_2} = V \cdot \frac{M}{V_M} = 1{,}9876 \cdot 10^8 \text{ m}^3 \cdot \frac{(12 + 2 \cdot 16) \text{ kg/kmol}}{22{,}4 \text{ m}^3\text{/kmol}} = 3{,}8 \cdot 10$