1. a) bez aspiratora

$A_1 = \frac{2,2^2}{4}\pi = 3,8\ m^2$

$c_1 = 26,04\ m/s$

$H = 46,43$

$P_a = 45,09\ MW$

b) sa aspiratorom

$H_n = 53,44$

$P_a = 51,9\ MW$

$\Delta P = 6,81$

10. $Q_{SP} = (2200 - 2H)/3$

$H_B = 58\ m$

$\eta = 0,9$

W_{600}^{22}

$H_m = H_B = 58\ m$

$Q_{SP}(H_{zah}) = Q(593) = 338\ m^3/s$

$W = 1,21 \cdot 10^{12}\ Wh$

$W = 1213\ GWh$

11. $Q_{SP} = (2200 - 2H)/3$

$H_m = H_A + (H_z - H_d) = 422\ m$

$Q_{SP}(589) = 340,67\ m^3/s$

$W = 8895\ GWh$

2. a) bez difuzora

$A_t = \frac{D_t^2 \Pi}{4} = 8{,}55\ m^2$

$c_t = \frac{Q}{A_t} = 10{,}52\ m/s$

$H_n = 86{,}36\ m$

$P_a = 9810 \cdot Q \cdot H_n = 76{,}25\ MW$

b) sa difuzorom

$A_d = \frac{D_d^2 \Pi}{4} = 14{,}52\ m^2$

$c_d = 6{,}197\ m/s$

$H_n = 96{,}74\ m$

$P_b = 85{,}41\ MW$

$\Delta P = P_b - P_a = 9{,}16\ MW$

3. $P_{max} = 1900\,MW \Rightarrow P_v = 1100$

$P_{min} = 800\,MW$

$T_v = 20h$

$\alpha = \beta = 0,7$

$P_{NE} = 600\,MW$

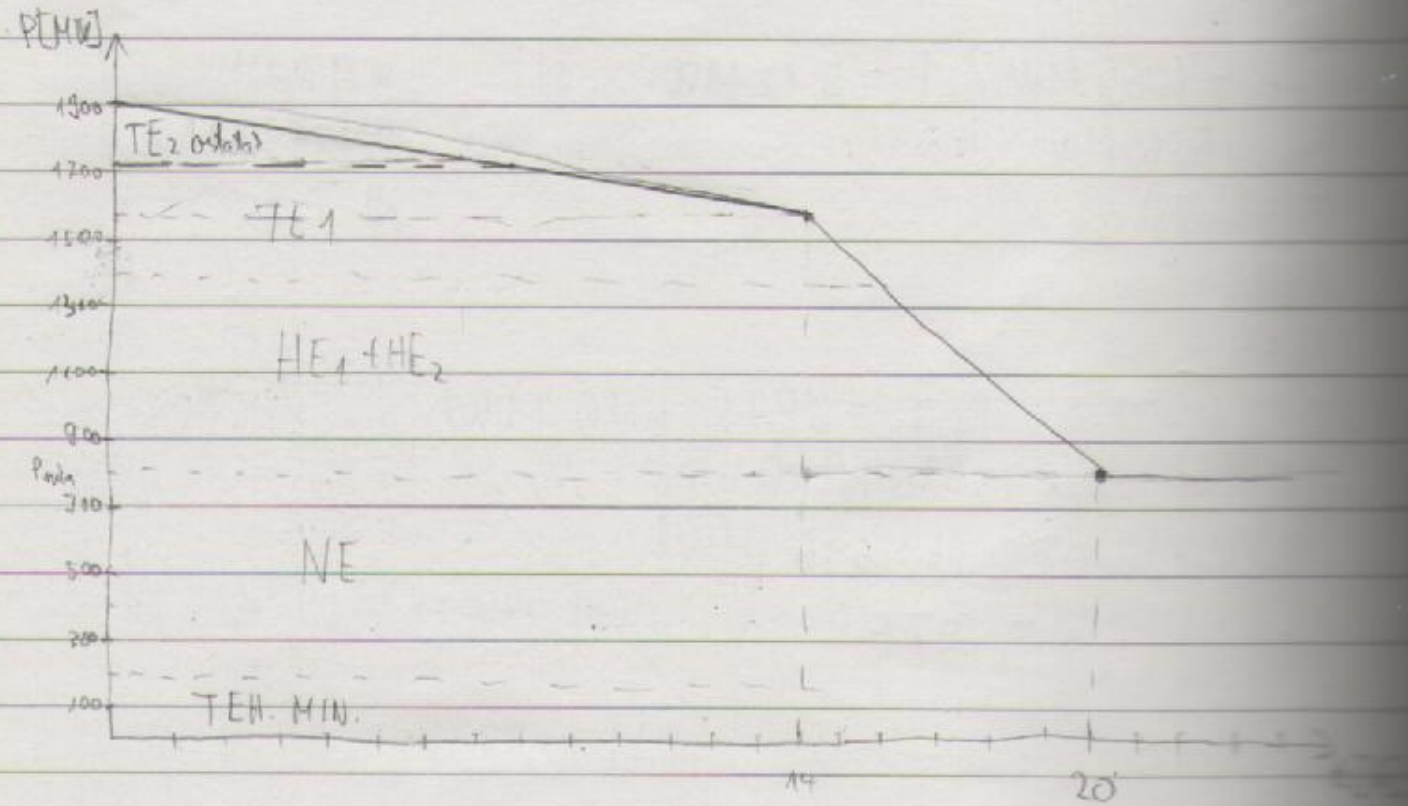
$P_{TE1} = 422\,MW$, $P_{TE,HA} = 100\,MW$

$P_{TE2} = 422\,MW$

$P_{HE} = 300\,MW$

$P_{HE} = 300\,MW$

$\alpha \cdot T_v = 14h$ $\beta \cdot P_v = 770\,MW$ $(1-\beta) \cdot P_v = 330\,MW$



$W_{TE2} = ?$

$W_{TE2} = 24 \cdot P_{TEH.MIN} + \frac{1}{2} \cdot 178.8 = 3112\,MWh$

4. $P_{max} = 1900 MW$

$P_{min} = 800 MW$

$T_V = 20 h$

$\alpha = \beta = 0,7$

$$P_{max\,12} = P_{max} - P_{NE} - 2 \cdot P_{H_2} - 2 \cdot P_{T\,min} - P_{IE\,1}$$

$$= 280 MW$$

5. $P_{max} = 1071\ MW$, $P_{min} = 500\ MW$ } $P_V = P_{max} - P_{min} = 571\ MW$

$T_V = 15,5\ h$

$W = 16951\ MWh$

$\beta = 0,591$

$\alpha = ?$

$W_K = 24 \cdot P_{min} = 12000\ MWh$

$W_V = W - W_K = 4951\ MWh$

$\alpha + \beta = \frac{2 W_V}{P_V \cdot T_V} \Rightarrow \alpha = \frac{2 \cdot 4951}{571 \cdot 15,5} - 0,591$

$\alpha = 0,527$

6. $P_{max} = 1068\ MW$, $P_{min} = 556\ MW$ } $P_V = 512\ MW$

$T_V = 18,7\ h$

$\alpha = 0,74$

$\beta = 969$

$W_V = (\alpha + \beta) \cdot 0,5 \cdot P_V \cdot T_V = 6845,696\ MWh$

$W_K = 24 \cdot P_{min} = 13344\ MWh$

$W = W_V + W_K = 20189,696\ MWh$

$m = \frac{W}{24 \cdot P_{max}} = 0,7876$

8. $m = \frac{12 + t_1}{24} \Rightarrow t_1 = 24 \cdot 0{,}64 - 12 = 3{,}36$

$Q_2 = 240 - 20 \cdot 3{,}36 = 172{,}8$

7. $Q = 299 - 20t$

$\eta = 0{,}85$

$H_2 = \frac{Q}{10} + 20$

$Q_1 = Q_{sr}(6) = 299 - 20 \cdot 6 = 179 \ m^3/s$

$H_2(299) = 49{,}9 \ m$

$P_{max} = Q_1 \cdot 9810 \cdot \eta \cdot H_2 = 74{,}48 \ MW$

10. $Q_{SR} = (2200 - 2H)/3$

$H_m = H_B = 58\ m$

$Q_{SR}(58) = (2200 - 2 \cdot 58)/3 = 694,67$

$W = 8760 \cdot 0,8 \cdot P$

9. $W_{BRUTO} = 8760 \cdot 9810 \cdot \int_{H_d}^{H_1} Q_{SR}(H)\,dH =$

$= 8760 \cdot 9810 \cdot \left(2200 \cdot \frac{1}{3} H - \frac{1}{3} H^2\right)\Big|_{130}^{773}$

$= 23,89\ TWh$

12. $P_{max} = 860\ MW$

$P_{min} = 527\ MW$

$T_v = 15,4\ h$

$\alpha = 0,71$

$\beta = 0,69$

$W_v = ?$

$W_v = 0,5(\alpha + \beta) P_v T_v \quad , \quad P_v = P_{max} - P_{min}$

$W_v = 3589,74\ MWh$

11. $Q_{SR} = (2200 - 2H)/3$

$H_z = 589\ m\ n.v.$

$H_B = 60\ m$

$H_D = 227\ m\ n.v.$

$\eta = 0,9$

$t = T - 0,8$

$W = ?$

$W = 8760 \cdot 0,8 \cdot P_{210} \cdot \quad P = 9810 \cdot Q_{SRd} \cdot H_n \cdot \eta_d$

$H_n = H_B + H_{zab} - H_b = 422\ m$

$Q(422\ m) = (2200 - 2 \cdot 422)/3 = 452$

14. $Q_i = 116\ m^3/s$

$Q = 283 - 17{,}1t$

$H_n = 16{,}6\ m$

$\eta = 0{,}82$

$P_{max} = P_i = 9810 \cdot Q_i \cdot \eta \cdot H_n = 15{,}49\ MW$

13. $Q_i = 148\ m^3/s$ } $148 = 293 - 19{,}9t_i \Rightarrow t_i = 6{,}78\ mj$

$Q = 283 - 19{,}9t$ }

$H_n = 10{,}7\ m$

$\eta = 0{,}76$

$$W = 9810 \cdot \eta \cdot H_n \left(Q_i \cdot \int_0^{6{,}78} dt + \int_{6{,}78}^{12} (283 - 19{,}9t)\, dt \right)$$

$$W = 9810 \cdot 0{,}76 \cdot 10{,}7 \left(148 \cdot 6{,}78 + \left(283t - 19{,}9 \frac{t^2}{2} \right) \Big|_{6{,}78}^{12} \right)$$

$$= 79774{,}92 \left(1003{,}44 + 283 \cdot 5{,}22 - 19{,}9 \cdot 0{,}5 \left(12^2 - 6{,}78^2 \right) \right)$$

$W = 120084036{,}7 \cdot 24 \cdot 30$

$W = 86{,}46\ GWh$

15. $Q_i = 129\ m^3/s$

$Q = 285 - 19{,}7t\ m^3/s$

$H_n = 11{,}3\ m$

$\eta = 0{,}78$

$m = ?$

$Q_i = Q \Rightarrow 129 = 285 - 19{,}7t \Rightarrow t_i = 7{,}92\ mj.$

$m = \frac{W}{W_i} = \frac{W}{P_i \cdot T}$

$$W = 9810 \cdot \eta \cdot H \cdot \left(Q_i \cdot \int_0^{t_i} dt + \int_{t_i}^{12} Q(t)\,dt \right)$$

$$W = 86465{,}34 \left(129 \cdot 7{,}92 + \underbrace{\int_{7{,}92}^{12} (285 - 19{,}7t)\,dt}_{I} \right)$$

$$I = \left(285t - \frac{19{,}7}{2} t^2 \right) \Big|_{7{,}92}^{12} = 285 \cdot 12 - \frac{19{,}7}{2} \cdot 12^2 - 285 \cdot 7{,}92 + \frac{19{,}7}{2} \cdot 7{,}92^2$$

$I = 362{,}255$

$W = 1{,}19 \cdot 10^3$

$P_i = P_{max} = 9810 \cdot 11{,}3 \cdot 0{,}78 \cdot Q_i = 1{,}115 \cdot 10^7\ W$

$m = \frac{W \cdot 24 \cdot 30}{P_i \cdot T} = 0{,}877$