



Absorption cycle calculation

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Generator

$$T_3 = 83 \text{ [C]}$$

$$x_3 = 60,6 \text{ [%]}$$

$$x_7 = 55,1 \text{ [%]}$$

$$x_1 = x_7$$

$$\dot{m}_1 = \frac{0,04675}{1,004} \cdot 1 \text{ [kg/s]}$$

$$P_3 = P_{\text{LIBR}} \text{ ['SI'; } T_3; x_3 \text{]}$$

$$h_3 = H_{\text{LIBR}} \text{ ['SI'; } T_3; x_3 \text{]}$$

$$T_2 = T_3 - 10 \text{ [C]}$$

$$h_2 = h \text{ ['SteamNBS'; } T = T_2 + 273,15 \text{ [C]; } P = P_3 \text{]}$$

$$T_1 = T_3 - 20 \text{ [C]}$$

$$h_1 = H_{\text{LIBR}} \text{ ['SI'; } T_1; x_7 \text{]}$$

$$\dot{m}_1 = \dot{m}_2 + \dot{m}_3$$

$$\dot{m}_1 \cdot x_1 = \dot{m}_2 \cdot 0 \text{ [%]} + \dot{m}_3 \cdot x_3$$

$$h_1 \cdot \dot{m}_1 - h_2 \cdot \dot{m}_2 - h_3 \cdot \dot{m}_3 + Q_{\text{gen}} = 0$$

Condenser

$$T_4 = T_{\text{sat}} \left[\text{'Water'} ; P = P_3 \right]$$

$$h_4 = h \left[\text{'Water'} ; T = T_4 ; P = P_3 + 10 \text{ [kPa]} \right]$$

$$Q_{\text{cond}} = [h_2 - h_4] \cdot \dot{m}_2$$

Throttle

$$T_7 = T_4$$

$$P_7 = P_{\text{LIBR}} \left[\text{'SI'} ; T_7 ; x_7 \right]$$

$$h_5 = h_4$$

$$T_5 = T_{\text{sat}} \left[\text{'Water'} ; P = P_7 \right]$$

Evaporator

$$h_6 = h \left[\text{'Steam}_{\text{NBS}}' ; T = T_6 ; P = P_7 \right]$$

$$T_6 = T_5 + 5 \text{ [C]}$$

$$Q_{\text{evap}} = \dot{m}_2 \cdot [h_6 - h_5]$$

Absorber

$$h_7 = H_{\text{LIBR}} \left[\text{'SI'} ; T_7 ; x_7 \right]$$

$$h_9 = h_{10}$$

$$h_6 \cdot \dot{m}_2 + h_{10} \cdot \dot{m}_3 - Q_{\text{abs}} = h_7 \cdot \dot{m}_1$$

Generator Heat Exchanger

$$h_7 = h_8$$

$$T_8 = T_7$$

$$\dot{m}_1 \cdot [h_1 - h_8] = \dot{m}_3 \cdot [h_3 - h_e]$$

$$h_e = H_{\text{LIBR}} \left[\text{'SI'} ; T_9 ; x_3 \right]$$

$$h_9 = h_e$$

$$h_{m,9} = H_{\text{LIBR}} \left[\text{'SI'} ; T_7 ; x_3 \right]$$

$$\varepsilon = \frac{h_3 - h_e}{h_3 - h_{m,9}}$$

Throttle

Call **Q_{LIBR}** ['SI' ; h₁₀ ; P₇ ; x₉ : q ; T₁₀ ; x_l ; hl ; hv]

Overall

$$\text{COP} = \frac{Q_{\text{evap}}}{Q_{\text{gen}}}$$

$$\text{CheckQ} = Q_{\text{gen}} + Q_{\text{evap}} - Q_{\text{abs}} - Q_{\text{cond}}$$

$$P_8 = P_3$$

$$P_1 = P_3$$

$$P_9 = P_3$$

$$P_2 = P_3$$

$$P_4 = P_3$$

$$P_6 = P_7$$

$$P_5 = P_7$$

$$P_{10} = P_7$$

$$x_2 = 0$$

$$x_4 = 0$$

$$x_5 = 0$$

$$x_6 = 0$$

$$x_8 = x_7$$

$$x_9 = x_3$$

$$T_{17} = 85 \text{ [C]}$$

$$T_{18} = 80 \text{ [C]}$$

$$Q_{\text{gen}} = \dot{m}_{17} \cdot \text{Cp} \text{ ['Water' ; T = T}_{17} \text{ ; P = 100 [kPa]}] \cdot [T_{17} - T_{18}]$$

$$T_{13} = 20 \text{ [C]}$$

$$T_{14} = 15 \text{ [C]}$$

$$Q_{\text{evap}} = \dot{m}_{13} \cdot \text{Cp} \text{ ['Water' ; T = T}_{13} \text{ ; P = 100 [kPa]}] \cdot [T_{13} - T_{14}]$$

$$T_{15} = 30 \text{ [C]}$$

$$T_{16} = 38 \text{ [C]}$$

$$Q_{\text{cond}} = \dot{m}_{15} \cdot \text{Cp} \text{ ['Water' ; T = T}_{15} \text{ ; P = 100 [kPa]}] \cdot [T_{16} - T_{15}]$$

$$T_{11} = 30 \text{ [C]}$$

$$T_{12} = 38 \text{ [C]}$$

$$Q_{\text{abs}} = \dot{m}_{11} \cdot \text{Cp} \text{ ['Water' ; T = T}_{11} \text{ ; P = 100 [kPa]}] \cdot [T_{12} - T_{11}]$$

SOLUTION

Unit Settings: [kJ]/[C]/[kPa]/[kg]/[degrees]

CheckQ = 0,000 [kJ/s]

 $\varepsilon = 0,661$ $h_v = 2592$ [kJ/kg] $h_{10} = 144,3$ [kJ/kg] $h_3 = 201,2$ [kJ/kg] $h_5 = 159,0$ [kJ/kg] $h_7 = 89,8$ [kJ/kg] $h_9 = 144,3$ [kJ/kg] $h_{m,9} = 115,1$ [kJ/kg] $\dot{m}_{11} = 0,3766$ [kg/s] $\dot{m}_{15} = 0,3802$ [kg/s] $\dot{m}_2 = 0,00423$ [kg/s] $P_1 = 6,616$ [kPa] $P_2 = 6,616$ [kPa] $P_4 = 6,616$ [kPa] $P_6 = 1,117$ [kPa] $P_8 = 6,616$ [kPa] $q = 0,2858$ $Q_{\text{cond}} = 12,722$ [kJ/s] $Q_{\text{gen}} = 15,322$ [kJ/s] $T_{10} = 49,09$ [C] $T_{12} = 38$ [C] $T_{14} = 15$ [C] $T_{16} = 38$ [C] $T_{18} = 80$ [C] $T_3 = 83,0$ [C] $T_5 = 8,6$ [C] $T_7 = 38,0$ [C] $T_9 = 53,2$ [C] $x_2 = 0,000$ [%] $x_4 = 0,000$ [%] $x_6 = 0,000$ [%] $x_8 = 55,1$ [%] $x_i = 60,77$ [%]

COP = 0,653

 $h_l = 137,3$ [kJ/kg] $h_1 = 141,5$ [kJ/kg] $h_2 = 3169,3$ [kJ/kg] $h_4 = 159,0$ [kJ/kg] $h_6 = 2525,7$ [kJ/kg] $h_8 = 89,8$ [kJ/kg] $h_e = 144,3$ [kJ/kg] $\dot{m}_1 = 0,04656$ [kg/s] $\dot{m}_{13} = 0,4782$ [kg/s] $\dot{m}_{17} = 0,7298$ [kg/s] $\dot{m}_3 = 0,04234$ [kg/s] $P_{10} = 1,117$ [kPa] $P_3 = 6,616$ [kPa] $P_5 = 1,117$ [kPa] $P_7 = 1,117$ [kPa] $P_9 = 6,616$ [kPa] $Q_{\text{abs}} = 12,602$ [kJ/s] $Q_{\text{evap}} = 10,00$ [kJ/s] $T_1 = 63,0$ [C] $T_{11} = 30$ [C] $T_{13} = 20$ [C] $T_{15} = 30$ [C] $T_{17} = 85$ [C] $T_2 = 73,0$ [C] $T_4 = 38,0$ [C] $T_6 = 13,6$ [C] $T_8 = 38,0$ [C] $x_1 = 55,100$ [%] $x_3 = 60,600$ [%] $x_5 = 0,000$ [%] $x_7 = 55,100$ [%] $x_9 = 60,600$ [%]

No unit problems were detected.