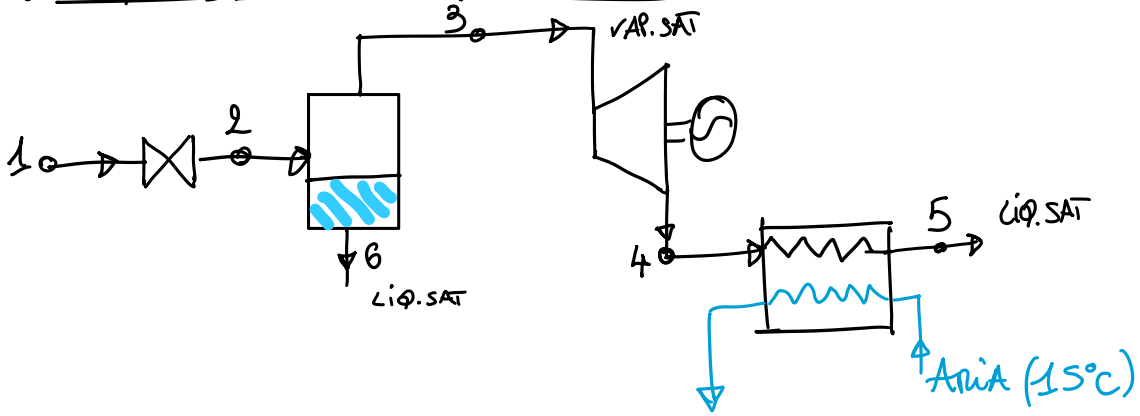
Ese1

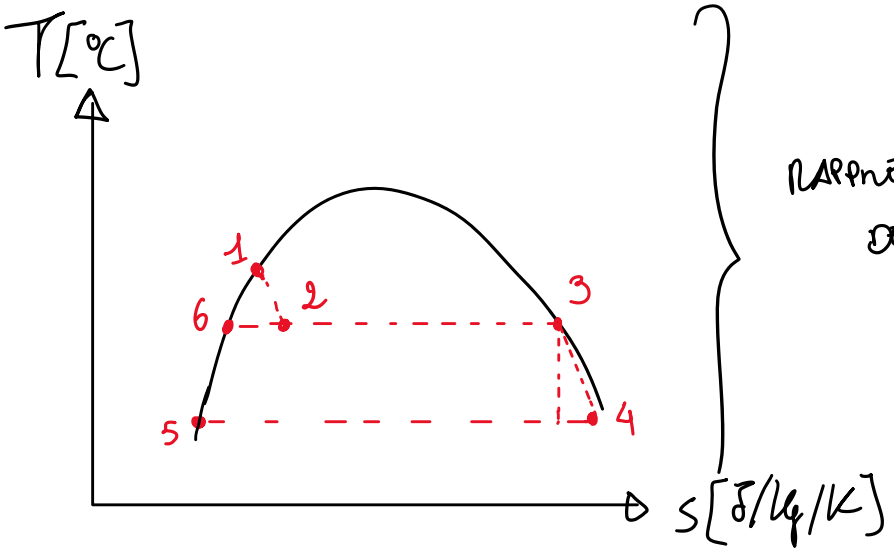
venerdì 25 giugno 2021 16:43

ESE 1

- LAVORI SISTEMA COMPLESSIVO



- T-s



RAPPRESENTAZIONE QUALITATIVA DEI PUNTI TERMODINAMICI

- X_2 ?

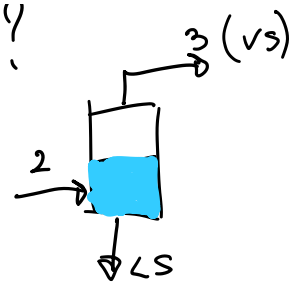
$h_1 = h(T_1; X = 0) = 376,94$ kJ/kg (TABELLA)

$h_2 = h_1$ CALDAIA ADIABATICA (ISOENTALPICA)

$h_2 = h_{LS}(P_2 = 0,5\,bar) + X_2\,\Delta h_{vap}(P_2) \Longrightarrow X_2 = 0,0158$

$(2645,99 - 340,56)\frac{kJ}{kg}$

- m_2 ?



$$\dot{m}_{VS} = \dot{m}_4 = \dot{m}_2 \cdot x_2 = 0{,}24 \ kg/s$$

- η_{IS} DELLA TV ?

$$\dot{W}_{EC,TV} = \dot{m}_3 \Delta h_{IS} \cdot \eta_{IS} \cdot \eta_{MECC-EL} \Longrightarrow \eta_{IS} = 0{,}955$$

$$\Delta h_{REALE} = \Delta h_{IS} \cdot \eta_{IS} = 257{,}7 \ \frac{kJ}{kg}$$

$$h_4 = h_3 - \Delta h_{REALE} = 2388{,}8 \ \frac{kJ}{kg}$$

$$h_4 = h_{LS} + x_4 \Delta h_{VAP}(P_4 = 0{,}08 \ bar) \longrightarrow x_4 = 0{,}92$$

$$S_4 = S_{LS} + x_4 \Delta S_{VAP}(P_4) = 7{,}62 \ \frac{kJ}{kgK}$$

- $\dot{m}_{ARIA}$?

$$\dot{m}_{aria} c_{p\,aria} \underbrace{\Delta T_{aria}}_{20°C} = \dot{m}_4 (h_4 - h_5) \Longrightarrow \dot{m}_{aria} = 26{,}15 \ kg/s$$

$$h(P_5; x=0) = 173{,}865 \ \frac{kJ}{kg}$$

Ese2

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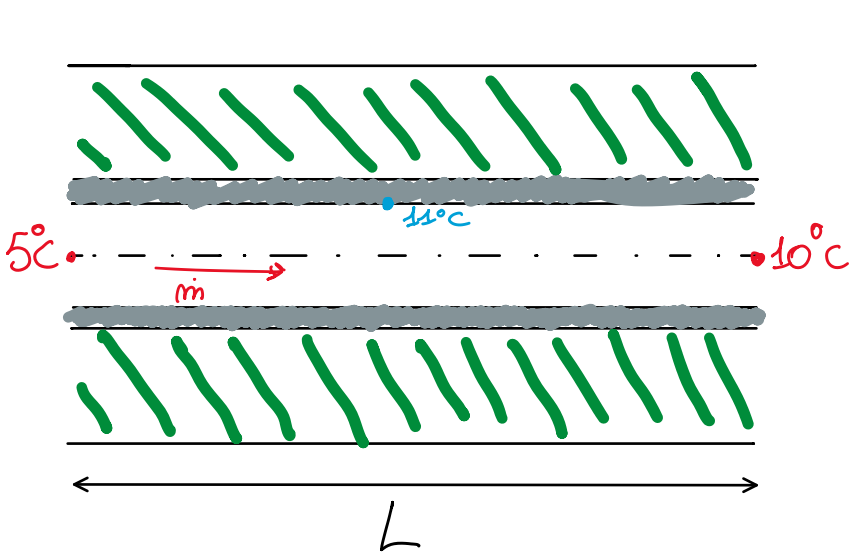
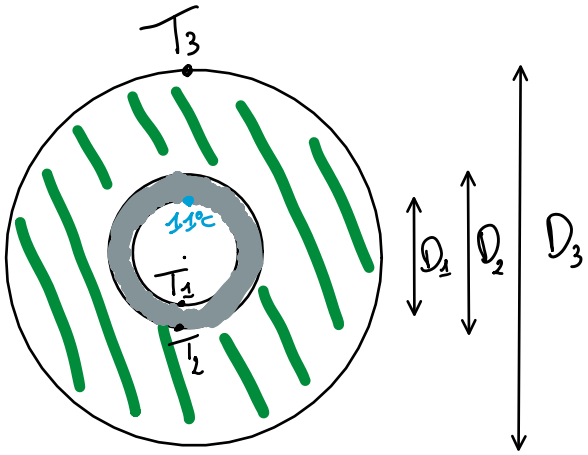




- ACQUA LIQUIDA (DIFFERENZA DI ENTALPIA) (DIFFERENZA DI PRESSIONE NULLA)

$$dh = c\,dT \Rightarrow \Delta h = c\,\Delta T = 20930 \ J/kg$$

- COEF. SCAMBIO TERMICO CONVETTIVO

$$Nu = 0{,}023\, Re^{0{,}8}\, Pr^{0{,}4}$$

$$Pr = \left.\frac{c\mu}{K}\right|_{H_2O} = 3{,}427$$

$$Re = \frac{\rho v D_1}{\mu}$$

PORTATA MASSICA $\dot{m} = \rho v \frac{D_1^2}{4}\pi \rightarrow v = \frac{\dot{m}}{\rho \frac{\pi D_1^2}{4}}$

$$Re = \frac{\rho \dot{m} 4 \cancel{D_1}}{\rho \pi D_1^{\cancel{2}} \mu} = \frac{4\dot{m}}{\pi D_1 \mu}$$

$$h = 0{,}023 \left(\frac{4\dot{m}}{\pi D_1 \mu}\right)^{0{,}8} Pr^{0{,}4} \frac{K}{D_1}$$

$$h = Z\, \dot{m}^n \qquad n = 0{,}8$$

$$Z = 4049 \ \frac{W}{m^2 K}\left(\frac{s}{kg}\right)^{0{,}8}$$

- $\Delta T_{ml} = \dfrac{(T_{IN} - T_1) - (T_{OUT} - T_1)}{\ln\left(\dfrac{T_{IN} - T_1}{T_{OUT} - T_1}\right)} = 2{,}8\,°C$

$$\dot{Q} = A_{scambio}\, h\, \Delta T_{ml} = \dot{m}\, c\, \Delta T_{H_2O}$$

$$A_{scambio}\, \dot{m}^{n}\, \Delta T_{ml} = \dot{m}\, c\, \Delta T_{H_2O}$$

$$\dot{m} = \left(\frac{c\,\Delta T_{H_2O}}{2\,\Delta T_{ml}\, A_{scambio}}\right)^{1/(n-1)} = 1{,}09\ kg/s$$

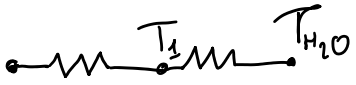
$\hookrightarrow \pi D_2 L$

$$\dot{Q} = \dot{m}\, c\, \Delta T_{H_2O} = 22{,}83\ kW$$

- $R_{COND,TOT}$?

$R_{COND\,TOT} = R_{MET} + R_{ISO} = 0{,}0015\ \frac{K}{W}$ (2 Resistenze in Serie)

$R_{MET} = \dfrac{\ln(D_1/D_2)}{2\pi K_{MET} L} = 2{,}247 \cdot 10^{-5}\ K/W$ $\quad R_{ISO} = \dfrac{\ln(D_3/D_2)}{2\pi K_{ISO} L} = 0{,}0027\ \frac{K}{W}$



$R_{TOT} = R_{COND\,TOT} + R_{CONV} = R_{COND\,TOT} + \dfrac{1}{h A_i} = 0{,}00286\ \frac{K}{W}$