Nomenclature

MED

When considering complete system, `med` suffix is added to the component variables.

> ## Nomenclature
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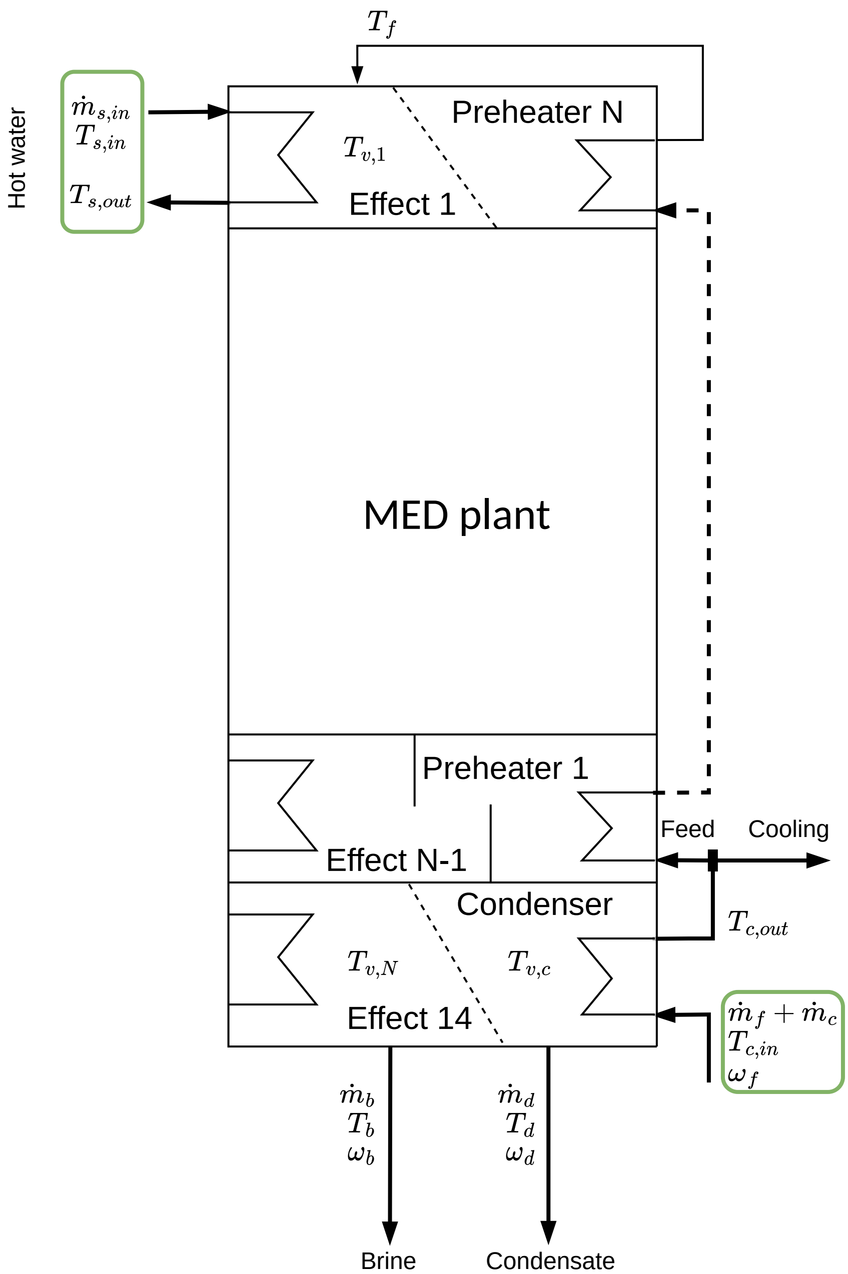
> 
>
>
> - Hot water
>   - $\dot{m}_s$ $[m^3/h]$ Hot water flow rate

- $T_{s,in}$ $[^\circ C]$ Hot water inlet temperature
    - $T_{s,out}$ $[^\circ C]$ Hot water outlet temperature
- Feed water
    - $\dot{m}_f$ $[m^3/h]$ Feed water flow rate
    - T_f $[^\circ C]$ Feed water temperature at first effect (preheated seawater)
- Cooling water
    - $\dot{m}_c$ $[m^3/h]$ Cooling water flow rate
    - $T_{c,in}$ $[^\circ C]$ Cooling water temperature at inlet of condenser
    - $T_{c,out}$ $[^\circ C]$ Cooling water temperature at outlet of condenser
- Products
    - Condensate
        - $\dot{m}_d$ $[m^3/h]$ Distillate production flow rate
        - T_d $[^\circ C]$ Distillate production temperature
        - ω_d $[g/L]$ Distillate production salinity
    - Brine
        - $\dot{m}_b$ $[m^3/h]$ Brine flow rate
        - T_b $[^\circ C]$ Brine temperature
        - ω_b $[g/L]$ Brine salinity
- Others
    - $T_{v,1}$ $[^\circ C]$ Vapor temperature in first effect
    - $T_{v,N}$ $[^\circ C]$ Vapor temperature in last effect
    - $T_{v,c}$ $[^\circ C]$ Vapor temperature in condenser
    - $t_{operated,i}$ $[hours]$ Time that the i th-effect has been operated since last cleanup

Inputs / outputs

$$\dot{m}_d, T_{s,out}, \dot{m}_c = f(\dot{m}_s, T_{s,in}, \dot{m}_f, T_{c,in}, T_{c,out}, [t_{operated,i}]_{i=1..N_{ef}})$$

$$\dot{m}_d, T_{s,out}, \dot{m}_c = f(\dot{m}_s, T_{s,in}, \dot{m}_f, T_{c,in}, T_{c,out})$$

Reasoning behind chosen outputs:

- $\dot{m}_d$ is part of the cost function.
- $T_{s,out}$. Necessary to estimate thermal performance.
- $\dot{m}_c$. Necessary to estimate electrical performance and feasibility of operation.

Solar field

When considering complete system, `sf` suffix is added to the component variables.

> ## Nomenclature
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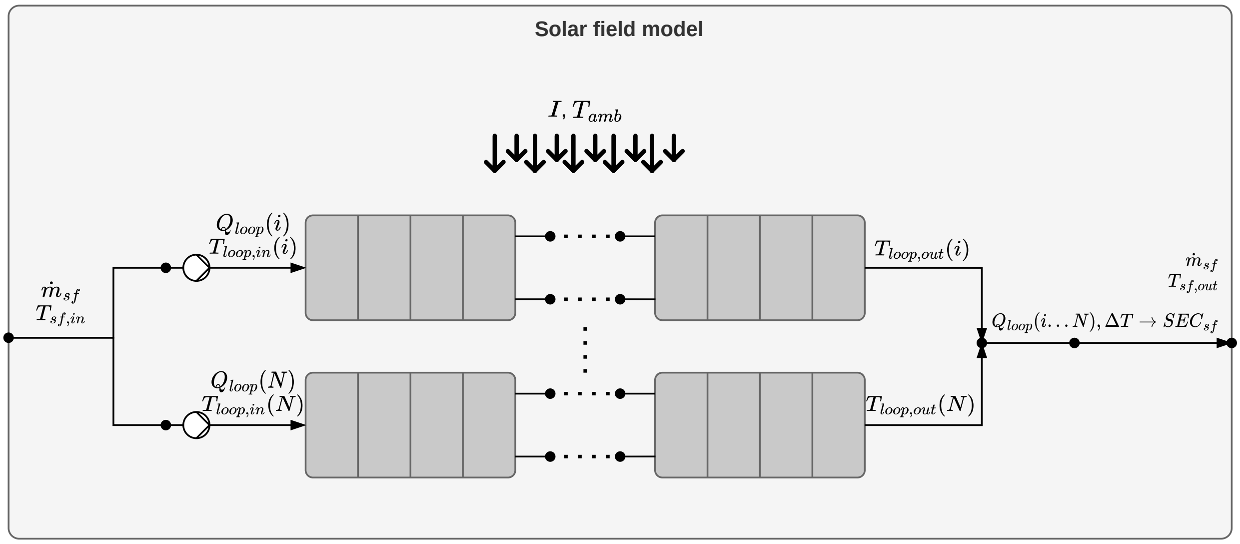
> 
>
>
> ### Inputs / outputs
>
> - T_{in} : $(^\circ C)$: Inlet temperature
> - T_{out} : $(^\circ C)$: Outlet temperature
> - $\dot{m}_{sf}$: (kg/s) : Total solar field flow rate
> - P_{gen} : (kW_{th}) : Thermal power generated
> - I : $(\frac{W}{m^2})$: Solar irradiance
> - T_{amb} : $(^\circ C)$: Ambient temperature
>
> ### Parameters
>
> - n_p : Number of parallel collectors in each loop
> - n_s : Number of serial connections of collectors rows
> - n_t : Number of parallel tubes in each collector
> - L_t : Length of the collector inner tube
> - H : $(\frac{J}{s \cdot ^\circ C})$: Thermal losses coefficient for the loop
> - β : (m) : Irradiance model parameter??
> - c_f : Conversion factor, used to add collectors depending on the configuration
> - A_{cs} : (m^2) :Flat plate collector tube cross-section area

Inputs / outputs

$$\dot{m}_{sf}, P_{gen}, SEC_{sf} = f(T_{in}, T_{out,k}, T_{out,k-1}, I, T_{amb})$$

$$\dot{m}_{sf} = f(T_{in}, T_{out}, I, T_{amb})$$

Parameters: $H, \beta, n_t, n_p, n_s, L_t, A_{cs}$

H and β are dynamic parameters to be calibrated, the rest are constant and characteristic of the solar field. H is a thermal loss coefficient, which depends on the temperature difference between the ambient and the system average temperature (approx.). β la verdad que no lo tengo muy claro todavía, imagino que es el que se ve potenciado por los espejos @Lidia. GA (genetic algorithms) approaches will be used.

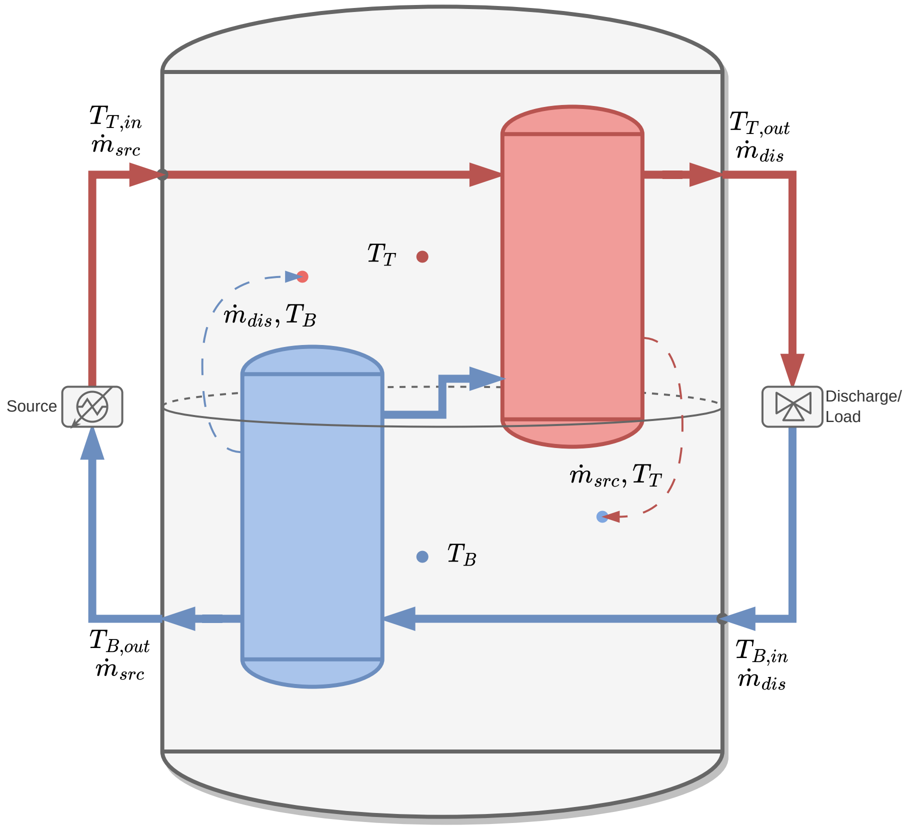
Por defecto:

- $H = 2.2 : [J \cdot s^{-1} \cdot {}^\circ C^{-1}]$
- $\beta = 0.0975 : [m]$
- $n_p = 7$
- $n_t = 50$
- $n_s = 2$
- $L_t = 1.94 : [m]$
- $c_f = 5 * 7 * 6 \cdot 10^5 : [sL \cdot min^-1 \cdot m^{-3}]$
- $A_{cs} = 7.85 \cdot 10^{-5} : [m^2]$

Thermal storage

When considering complete system, `ts` suffix is added to the component variables.

Nomenclature

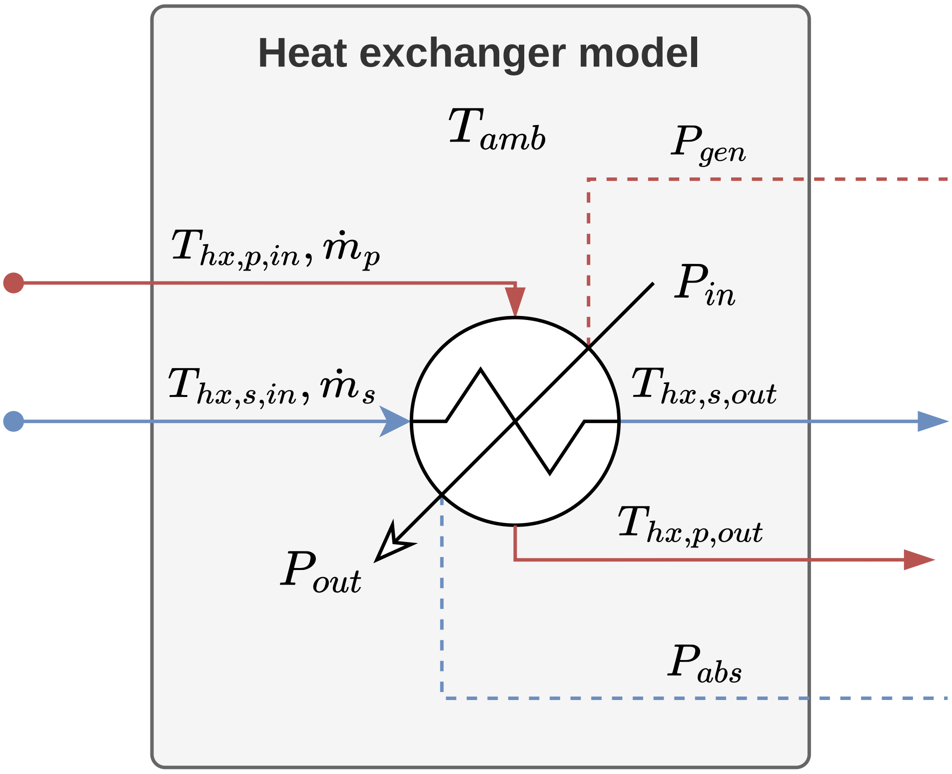


- $T_T\,(^\circ C)$: Temperature at the top half of the tank
- $T_B\,(^\circ C)$: Temperature at the bottom half of the tank
- $T_{B,in}\,(^\circ C)$: Inlet temperature to bottom of the tank after load
- $T_{B,out} = T_B\,(^\circ C)$: Outlet temperature from bottom of the tank to heat source
- $T_{T,in}\,(^\circ C)$: Inlet temperature from heat source to top of the tank
- $T_{T,out} = T_T\,(^\circ C)$: Outlet temperature from top of the tank to load
- $\dot{m}_{dis}\,(kg/s)$: Flow rate of energy sink (consumer)
- $\dot{m}_{src}\,(kg/s)$: Flow rate of heat source
- $E_{avail}\,(kWh_{th})$: Useful thermal energy stored in tank system
- $T_{min}\,(^\circ C)$: Useful temperature limit
- $T_{amb}\,(^\circ C)$: Ambient temperature

Heat exchanger

When considering complete system, `hx` suffix is added to the component variables.

Nomenclature



Loops (L):

- p : Primary (hot sink / side) loop
- s : Secondary (cold sink / side) loop
- $T_{hx,L,in}$ $(^{\circ}C)$: Inlet temperature
- $T_{hx,L,out}$ $(^{\circ}C)$: Outlet temperature
- $\dot{m}_L$ $(m^3/h?)$: Flow rate
- P_{gen} (kW_{th}) : Power supplied by the hot side
- P_{abs} (kW_{th}) : Power transferred to the cold side
- η_{hx} : Exchange efficiency
- T_{amb} $(^{\circ}C)$: Ambient temperature

Inputs / outputs

$$T_{hx,p,out}, T_{hx,s,out}, P_{gen}, P_{abs} = f(T_{hx,p,in}, T_{hx,s,in}, \dot{m}_p, \dot{m}_s, (UA)_{hx})$$

$$T_{hx,p,out}, T_{hx,s,out} = f(T_{hx,p,in}, T_{hx,s,in}, \dot{m}_p, \dot{m}_s, (UA)_{hx})$$

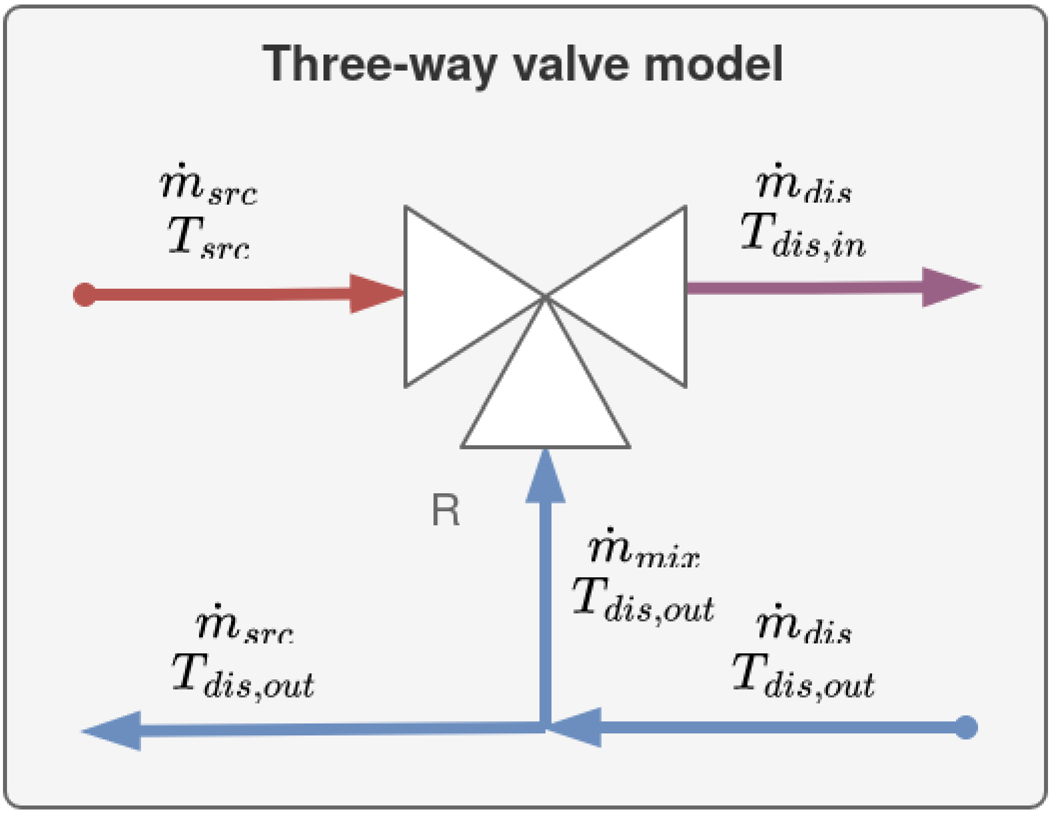
UA is a parameter to be calibrated. It depends on the heat exchange surface (if known it can just be substituted) and the heat transfer coefficient, which depends on the temperature difference between the ambient and heat exchanger. GA (genetic algorithms) approaches will be used.

- Por defecto $(UA)_{hx} = 28000 \, [\frac{W}{^\circ C}]$

Three-way valve

When considering complete system, `3wv` suffix is added to the component variables.

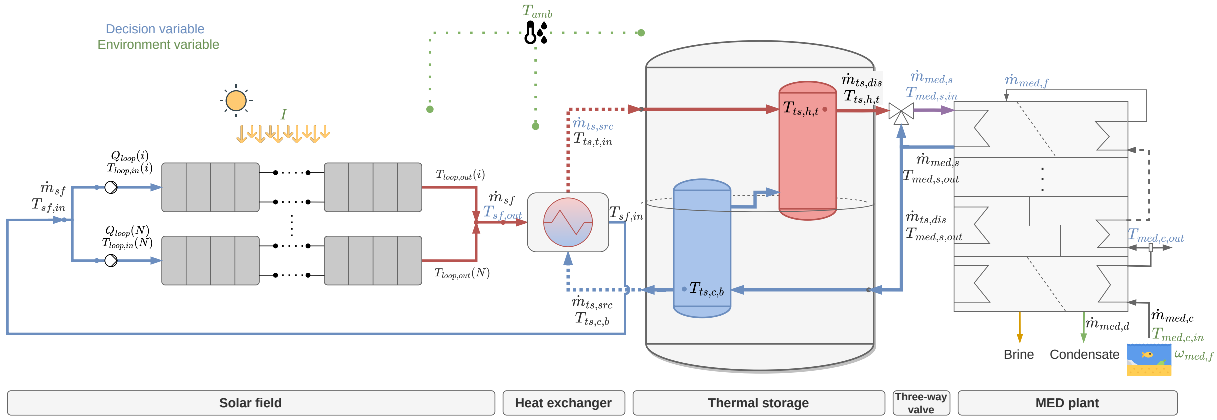
Nomenclature



- $T_{src} \, (^\circ C)$: Temperature from source (thermal storage)
- $T_{dis,in} \, (^\circ C)$: Inlet temperature to discharge (MED heat source inlet, $T_{med,s,in}$)
- $T_{dis,out} \, (^\circ C)$: Outlet temperature from discharge (MED heat source outlet, $T_{med,s,out}$)
- $\dot{m}_{dis} \, (kg/s)$: Flow rate through load / discharge
- $\dot{m}_{src} \, (kg/s) = (1 - R) \cdot \dot{m}_{dis}$: Flow rate from source
- $\dot{m}_{mix} = R \cdot \dot{m}_{dis} \, (kg/s)$: Fraction of flow rate from discharge that is mixed with source
- R: Ratio of $\dot{m}_{dis}$ that is mixed with $\dot{m}_{src}$

Complete system

Nomenclature



- MED
  - $T_{med,s,in}$
  - $T_{med,cw,out}$
  - $\dot{m}_{med,s}$
  - $\dot{m}_{med,f}$
- Solar field
  - $T_{sf,out}$
  - $\dot{m}_{sf}$
- Thermal storage
  - $T_{ts,t,in}$
  - $T_{ts,t}$
  - $T_{ts,b}$
  -

Inputs / outputs

$$\dot{m}_{med,d}, SEEC_{med}, STEC_{MED}, SEC_{sf} = f(last_state, current_inputs,)$$

UA is a parameter to be calibrated. It depends on the heat exchange surface (if known it can just be substituted) and the heat transfer coefficient, which depends on the temperature difference between the ambient and heat exchanger. GA (genetic algorithms) approaches will be used.