Desorber model

The only model parameter is the temperature of the desorber

The input data of the model are as follows (provided by other system components):

- the desorber pressure;
- the flow-rate of incoming process (the strong solution)
- the concentration of the strong solution

The outputs are:

- the desorber thermal load;
- the weak solution concentration;
- the refrigerant flow-rate;
- the weak solution flow-rate.

Graphical interface of the desorber

A graphical interface for the desorber can be deduced (Figure 1). It allows you to build the lower left of the screen, the rest being defined as a Thermoptim standard.

A peculiarity of this component is that it does not change the downstream refrigerant point whose state is considered an input. It would of course be possible to approach the problem from another angle, but we did not want to overcomplicate things in this example.

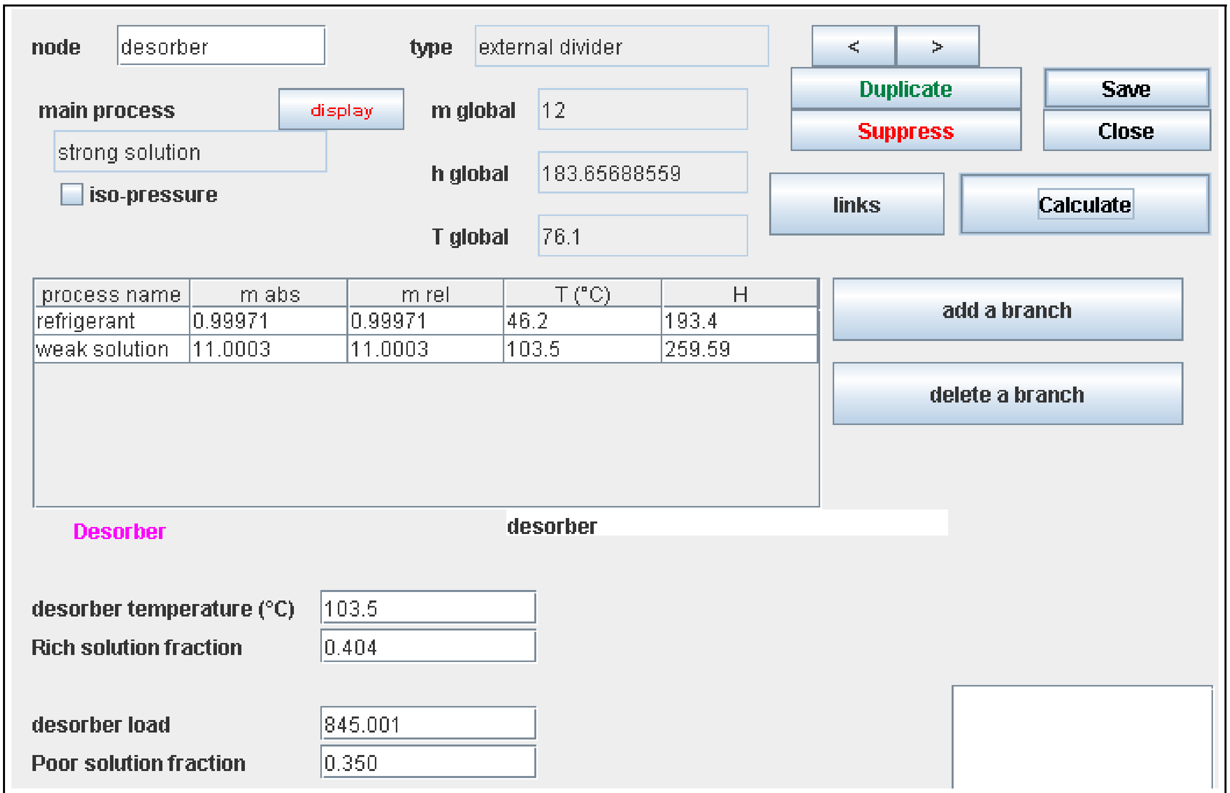

Figure 1: GUI of the desorber

Thermodynamic model

The model equations are obtained as follows, the thermodynamic fluid being defined by its own model.

Desorber (or generator)

The solution rich in refrigerant is introduced into the high-pressure high-temperature generator where it boils by contact with tubes heated either directly by a fuel or by steam. The vapor produced is almost pure refrigerant, due to the saturation pressure difference between the two fluids. It is then directed to the condenser. The depleted solution is removed for recycling.

With the assumption that the desorber is at constant temperature T_{gen} and the weak solution is saturated, the equations are:

The inversion of the equation of solution saturated vapor pressure $P_{gen} = P(x_{sp},T_{gen})$ provides the concentration x_{sp}, and enthalpy h_{spA}

Conservation of mass: $= m_{sr} = m_r + m_{sp}$

Conservation of the mass of solution: $(1 - x_{sp})\, m_{sp} = (1 - x_{sr})\, m_{sr}$

These two equations provide m_{sp} and m_r if x_{sr}, x_{sp} and m_{sr} are known:

$$m_{sp} = m_{sr} \frac{1 - x_{sr}}{1 - x_{sp}}$$

$$m_r = m_{sr} \frac{x_{sr} - x_{sp}}{1 - x_{sp}}$$

Conservation of enthalpy provides Q_{gen} : $m_r\, h_{r2} + m_{sp}\, h_{spA} = m_{sr}\, h_{srB} + Q_{gen}$

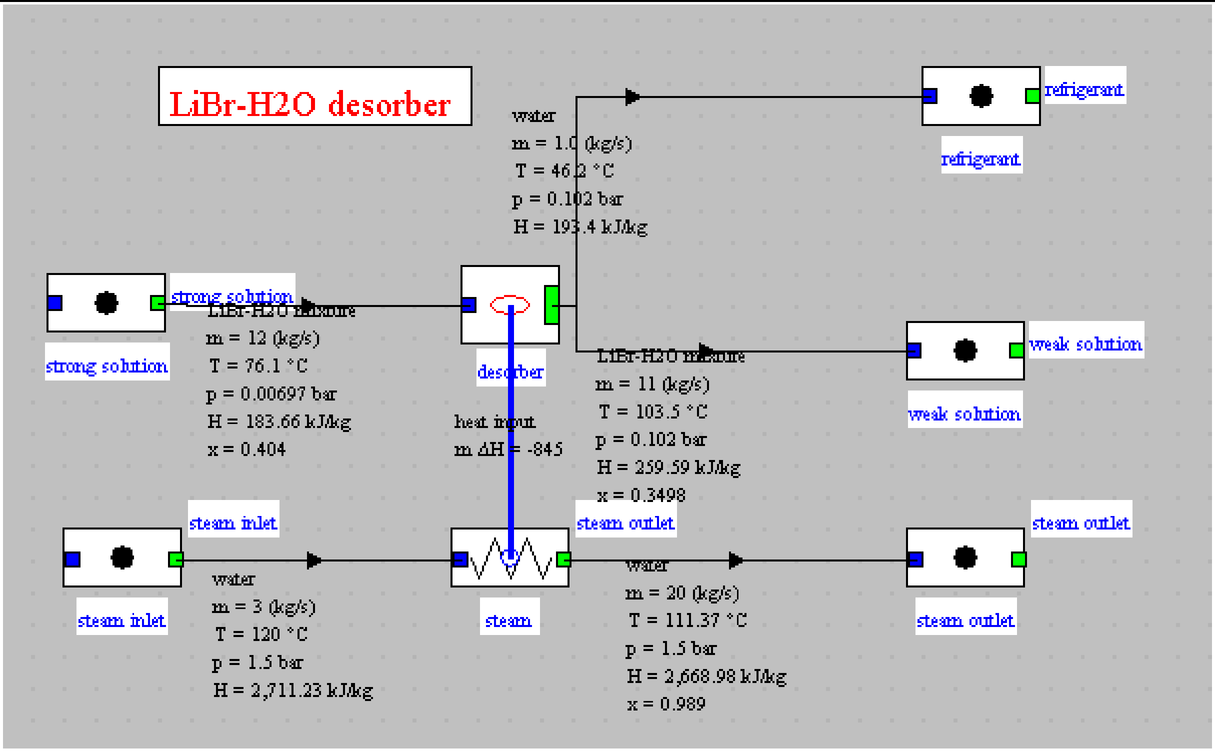

Figure 2: External mixer representing a desorber, with its connections

Sequence of calculations

In practice, the sequence of calculations is as follows:

1) consistency checking and updating of the node before calculation
2) reading of T_{gen} on the screen of the external node
3) Reverse $P_{gen} = P(x_{sp},T_{gen})$ to get x_{sp}
4) flow-rate calculation

5) calculation of the heat load Q_{gen}
6) updating of processes connected to the external node
7) update and calculation of the associated thermocoupler