Software Information

- Please check, whether your inputs, the equations applied and the charactersitics are displayed correctly.
- You are welcome to send your feedback via `https://github.com/oemof/tespy/issues`.
- LaTeXpackages required are:
  - graphicx
  - float
  - hyperref
  - booktabs
  - amsmath
  - units
  - cleveref
- To supress these messages, call the model documentation with the keyword draft=False.

TESPy Version:	0.4.3-002 - Grassmann's Graph
Commit:	4149348f@feature/result_report
CoolProp version:	6.4.0
Python version:	3.8.0 (default, Oct 28 2019, 16:14:01) [GCC 8.3.0]
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1 Connections in design mode

1.1 Specified connection parameters

label	m in kg/s	p in bar (1)	h in kJ/kg	T in °C (2)	v in m3/s	vol in m3/kg	s in kJ/kgK	x in −
0	1177.78	250.00	1094.69	600.00	8.17	0.01	2.77	-1.00
1	857.31	**75.00**	397.67	**35.00**	3.14	0.00	1.65	-1.00
2	857.31	**258.40**	450.33	123.23	1.68	0.00	1.67	-1.00
3	1177.78	**257.00**	885.84	433.69	6.28	0.01	2.50	-1.00
4	1177.78	**250.00**	1094.69	**600.00**	8.17	0.01	2.77	-1.00
5	1177.78	**77.95**	934.37	457.14	20.92	0.02	2.79	-1.00
6	857.31	**75.15**	558.65	128.23	7.48	0.01	2.12	-1.00
10	320.47	75.15	558.65	128.23	2.80	0.01	2.12	-1.00
11	320.47	**257.51**	670.11	264.14	1.18	0.00	2.15	-1.00
12	857.31	257.51	670.11	264.14	3.17	0.00	2.15	-1.00
13	1177.78	257.51	670.11	264.14	4.35	0.00	2.15	-1.00
14	1177.78	**76.94**	718.63	269.14	15.17	0.01	2.45	-1.00
15	1177.78	75.15	558.65	128.23	10.28	0.01	2.12	-1.00

Table 1: Specified connection parameters

1.2 Equations applied

$$0 = p - p_{\text{spec}} \tag{1}$$

$$0 = T\left(p, h\right) - T_{\text{spec}} \tag{2}$$

1.3 Specified fluids

label	CO2 (3)
0	1.00
1	**1.00**
2	1.00
3	1.00
4	1.00
5	1.00
6	1.00
10	1.00
11	1.00
12	1.00
13	1.00
14	1.00
15	1.00

Table 2: Specified fluids

1.4 Equations applied

$$0 = x_{\text{CO2}} - x_{\text{CO2,spec}} \tag{3}$$

1.5 Referenced values for temperature

label	reference	factor in -	delta in °C
11	12	1	0

Table 3: Referenced values for temperature

1.6 Equation applied

$$0 = \text{value} - \text{value}_{\text{ref}} \cdot \text{factor} + \text{delta} \tag{4}$$

2 User defined equations in design mode

3 Components in design mode

3.1 Components of type HeatExchangerSimple

3.1.1 Mandatory constraints

$$0 = \dot{m}_{\text{in},i} - \dot{m}_{\text{out},i} \; \forall i \in [1] \tag{5}$$

$$0 = x_{fl,\text{in},i} - x_{fl,\text{out},i} \; \forall fl \in \text{network fluids}, \forall i \in [1] \tag{6}$$

3.1.2 Component parameters

label	Q	pr	zeta
Heater	245974293.29	0.97	101.53
Water cooler	-138014256.36	1.00	4.06

Table 4: Parameters of components of type HeatExchangerSimple

3.2 Components of type CycleCloser

3.2.1 Mandatory constraints

$$0 = p_{\text{in},i} - p_{\text{out},i} \; \forall i \in [1] \tag{7}$$

$$0 = h_{\text{in},i} - h_{\text{out},i} \; \forall i \in [1] \tag{8}$$

3.3 Components of type Compressor

3.3.1 Mandatory constraints

$$0 = \dot{m}_{\text{in},i} - \dot{m}_{\text{out},i} \; \forall i \in [1] \tag{9}$$

$$0 = x_{fl,\text{in},i} - x_{fl,\text{out},i} \; \forall fl \in \text{network fluids}, \forall i \in [1] \tag{10}$$

3.3.2 Component parameters

label	P	eta_s (11)	pr
Compressor 1	45145931.33	**0.85**	3.45
Compressor 2	35720359.99	**0.85**	3.43

Table 5: Parameters of components of type Compressor

3.3.3 Equations applied

$$0 = -\left(h_{\text{out}} - h_{\text{in}}\right) \cdot \eta_{\text{s}} + \left(h_{\text{out,s}} - h_{\text{in}}\right) \tag{11}$$

3.4 Components of type HeatExchanger

3.4.1 Mandatory constraints

$$0 = \dot{m}_{\text{in},i} - \dot{m}_{\text{out},i} \; \forall i \in [1, 2] \tag{12}$$

$$0 = x_{fl,\text{in},i} - x_{fl,\text{out},i} \; \forall fl \in \text{network fluids}, \forall i \in [1, 2] \tag{13}$$

$$0 = \dot{m}_{\text{in},1} \cdot \left(h_{\text{out},1} - h_{\text{in},1}\right) + \dot{m}_{\text{in},2} \cdot \left(h_{\text{out},2} - h_{\text{in},2}\right) \tag{14}$$

3.4.2 Component parameters

label	Q	kA	td_log	ttd_u	ttd_l (15)	pr1	pr2	zeta1	zeta2
Recuperator 1	-188427545.84	37685833.42	5.00	5.00	**5.00**	0.98	1.00	14.73	52.80
Recuperator 2	-254083168.77	21284060.29	11.94	23.45	**5.00**	0.99	1.00	5.86	10.05

Table 6: Parameters of components of type HeatExchanger

3.4.3 Equations applied

$$0 = ttd_{\text{l}} - T_{\text{out},1} + T_{\text{in},2} \tag{15}$$

3.5 Components of type Turbine

3.5.1 Mandatory constraints

$$0 = \dot{m}_{\text{in},i} - \dot{m}_{\text{out},i} \; \forall i \in [1] \tag{16}$$

$$0 = x_{fl,\text{in},i} - x_{fl,\text{out},i} \; \forall fl \in \text{network fluids}, \forall i \in [1] \tag{17}$$

3.5.2 Component parameters

label	P	eta_s (18)	pr
Turbine	-188826328.26	**0.90**	0.31

Table 7: Parameters of components of type Turbine

3.5.3 Equations applied

$$0 = -\left(h_{\text{out}} - h_{\text{in}}\right) + \left(h_{\text{out,s}} - h_{\text{in}}\right) \cdot \eta_{\text{s}} \tag{18}$$

3.6 Components of type Splitter

3.6.1 Mandatory constraints

$$0 = \sum \dot{m}_{\text{in},i} - \sum \dot{m}_{\text{out},j} \; \forall i \in \text{inlets}, \forall j \in \text{outlets} \tag{19}$$

$$0 = x_{fl,\text{in}} - x_{fl,\text{out},j} \; \forall fl \in \text{network fluids}, \forall j \in \text{outlets} \tag{20}$$

$$0 = h_{in} - h_{\text{out},j} \; \forall j \in \text{outlets} \tag{21}$$

$$\begin{aligned} 0 &= p_{\text{in},1} - p_{\text{in},i} \; \forall i \in \text{inlets} \setminus \{1\} \\ 0 &= p_{\text{in},1} - p_{\text{out},j} \; \forall j \in \text{outlets} \end{aligned} \tag{22}$$

3.7 Components of type Merge

3.7.1 Mandatory constraints

$$0 = \sum \dot{m}_{\text{in},i} - \sum \dot{m}_{\text{out},j} \; \forall i \in \text{inlets}, \forall j \in \text{outlets} \tag{23}$$

$$0 = \sum_i \dot{m}_{\text{in},i} \cdot x_{fl,\text{in},i} - \dot{m}_{\text{out}} \cdot x_{fl,\text{out}} \; \forall fl \in \text{network fluids}, \forall i \in \text{inlets} \tag{24}$$

$$0 = \sum_i (\dot{m}_{\text{in},i} \cdot h_{\text{in},i}) - \dot{m}_{\text{out}} \cdot h_{\text{out}} \; \forall i \in \text{inlets} \tag{25}$$

$$\begin{aligned} 0 &= p_{\text{in},1} - p_{\text{in},i} \; \forall i \in \text{inlets} \setminus \{1\} \\ 0 &= p_{\text{in},1} - p_{\text{out},j} \; \forall j \in \text{outlets} \end{aligned} \tag{26}$$

4 Busses in design mode

4.1 Bus “total output power”

Specified total value of energy flow: $\dot{E}_{\text{bus}} = -100000000.000\,\text{W}$

$$0 = \dot{E}_{\text{bus}} - \sum_i \dot{E}_{\text{bus},i} \tag{27}$$

label	$\dot{E}_{\text{comp}}$	$\dot{E}_{\text{bus}}$	η
Turbine	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\dot{E}_{\text{comp}} \cdot \eta$	0.980
Compressor 1	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\frac{\dot{E}_{\text{comp}}}{\eta}$	0.951
Compressor 2	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\frac{\dot{E}_{\text{comp}}}{\eta}$	0.951

Table 8: total output power

4.2 Bus “heat input”

This bus is used for postprocessing only.

label	$\dot{E}_{\text{comp}}$	$\dot{E}_{\text{bus}}$	η
Heater	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\frac{\dot{E}_{\text{comp}}}{\eta}$	1.000

Table 9: heat input