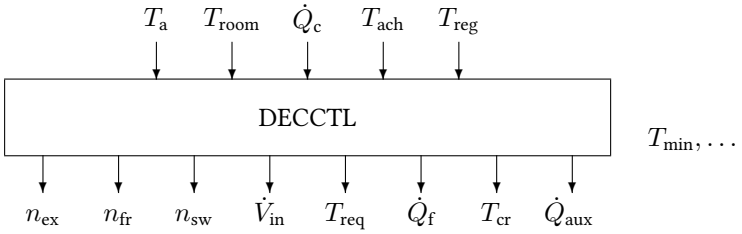
Block DECCTL

The DECCTL block controls the components of a desiccant cooling unit as a function of the required cooling load.

DEC



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Function	st0022
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Group	L

Inputs

1 Ambient temperature T_a / °C
2 Room temperature T_{room} / °C
3 Cooling load $\dot{Q}_c$ / kW
4 Achieved inlet air temperature as a result of the control strategy T_{ach} / °C
5 Regeneration air temperature T_{reg} / °C

Parameters

1 Minimum room inlet air temperature / °C
2 Minimum regeneration temperature / °C
3 Maximum regeneration temperature / °C
4 Nominal volume flow of fresh air ventilator / $m^3\,h^{-1}$
5 Nominal volume flow of regeneration air ventilator / $m^3\,h^{-1}$
6 Nominal power of auxiliary heating / kW
7 Auxiliary heating temperature accuracy / °C
8 Maximum number N_{max} of iterations
9 Normalised minimum air flow rate
10 Control strategy: 0 = electricity optimised; 1 = water consumption optimised

Outputs

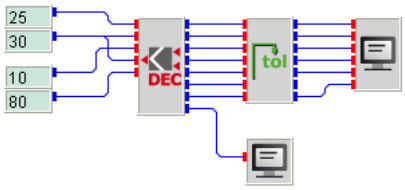
1	Status of exhaust air humidifier n_{ex}
2	Status of inlet air humidifier (stage 1 to 3) n_{fr}
3	Status of sorption wheel n_{sw}
4	Normalised volume flow rate of inlet air $\dot{V}_{in} \in [0, 1]$
5	Required air temperature T_{req} / °C
6	Free cooling power $\dot{Q}_f$ / kW
7	Controlled regeneration temperature T_{cr} / °C
8	Auxiliary heating power $\dot{Q}_{aux}$ / kW

Strings

None

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decctl.vseit



The main input of the DECCTL block is the achieved inlet air temperature (input 4) which is usually the result of the control stratgy of the DECCTL block itself and its corresponding TOL block.

In order to demonstrate the control behaviour of the DECCTL block this input remains unchanged as defined by a CONST block. In other words, the controller will switch on all units of the desiccant cooling systems which are available.

All other inputs, like ambient temperature etc are set constant as well: ambient temperature 25 °C, room temperature 30 °C, cooling load 10 kW, regeneration air temperature 80 °C.

The parameters of the DECCTL block are set to these values:

```
Minimum room inlet air temperature                    12
Minimum regeneration temperature                      45
Maximum regeneration temperature                     120
Nominal volume flow of fresh air ventilator         5000
Nominal volume flow of regeneration air ventilator  5000
Nominal power of auxiliary heating                  1000
Auxiliary heating temperature accuracy                 0.1
Maximum number of iterations                         100
Normalized minimum air flow rate                    1500
Control strategy                          0 = electricity optimized
```

Since one SCREEN block is directly connected to the TOL block it displays the values of all iteration steps while the second SCREEN block is called only after the iteration has stopped.

```
   0.0     0.0     0.0     0.0     0.0     0.0
   0.0     0.0     0.0     0.0    30.0    80.0
   0.0     0.0     0.0     0.3    12.0    80.0
   1.0     0.0     0.0     0.3    12.0    80.0
   1.0     1.0     0.0     0.3    12.0    80.0
   1.0     2.0     0.0     0.3    12.0    80.0
   1.0     3.0     0.0     0.3    12.0    80.0
   1.0     3.0     1.0     0.3    12.0    80.0
   0.0     0.0     0.0     1.0    24.0    80.0
   1.0     0.0     0.0     1.0    24.0    80.0
   1.0     1.0     0.0     1.0    24.0    80.0
   1.0     2.0     0.0     1.0    24.0    80.0
   1.0     3.0     0.0     1.0    24.0    80.0
   1.0     3.0     1.0     1.0    24.0    80.0
   1.0     3.0     1.0     1.0    24.0    80.0
   1.0     3.0     1.0     1.0    24.0   120.0
67.140
```

On initialization all outputs of the DECCTL block (and therefore also the outputs of the TOL block) are set to zero. In the first iteration the air flow of the desiccant cooling unit is switched on by 30 % and the required room temperature to achieve the cooling load demand of the given 10 kW is set to 12 °C.

In the next step the exhaust air humidifier is switched on. All options are switched on one after the other. As a result an auxiliary heating power of 67.140 kW would be required.