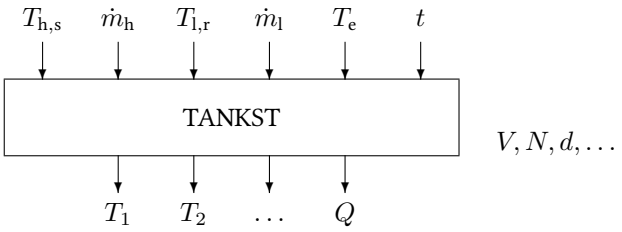
Block TANKST

The TANKST block simulates a stratified storage tank which can be used either as hot-water storage tank (case 1) or as cold-water storage tank (case 2).





Name	TANKST
Function	st0003
Inputs	6
Outputs	$N + 1$
Parameters	8
Strings	0
Group	D

Inputs

1	Supply temperature heat source $T_{\mathrm{h,s}}$/ °C: Case 1 (Hot-water storage tank): From collector/boiler Case 2 (Cold-water storage tank): From load
2	Heat source mass flow rate $\dot{m}_{\mathrm{h}}$ / kg s^{-1}
3	Return temperature cold source $T_{\mathrm{l,r}}$/ °C: Case 1 (Hot-water storage tank): From load Case 2 (Cold-water storage tank): From chiller
4	Cold source mass flow rate $\dot{m}_{\mathrm{l}}$ / kg s^{-1}
5	Environment temperature T_{e} / °C
6	Time / s

Outputs

1	Temperature of node 1 (top) T_1 / °C
2	Temperature of node 2 T_2 / °C
N	Temperature of node N (bottom) T_N / °C
N+1	Energy content of the storage Q / J

Parameters

1	Tank volume V / m^3
2	Number of temperature nodes $N \leq 200$

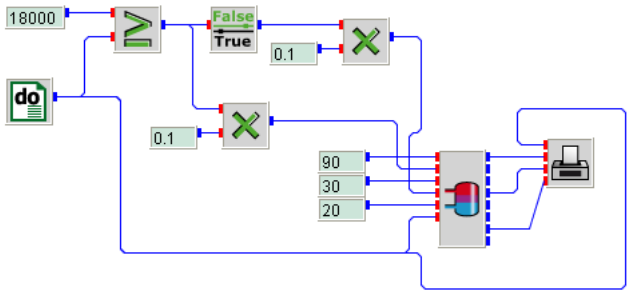
3 Tank diameter d / m
4 Specfic heat of fluid c_p / J kg^{-1} K^{-1}
5 Fluid density ρ / kg m^{-3}
6 Overall heat-loss coefficient U / W m^{-2} K^{-1}
7 Effective heat conductivity λ_{eff} / W m^{-1} K^{-1}
8 Initial tank temperature T_0 / °C

Strings

None

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tankst.vseit



A stratified storage tank with a volume of 0.75 m^3 and a diameter of 0.7 m is simulated over a time period of 36 000 seconds (10 hours) in steps of 20 seconds, as defined by a DO block. The tank fluid is assumed to be water with a specific heat capacity of 4190 J kg^{-1} K^{-1} and a density of 1000 kg/m^3. The overall heat-loss coefficient is set to 0.5 W m^{-2} K^{-1} at an initial tank temperature of 20 °C.

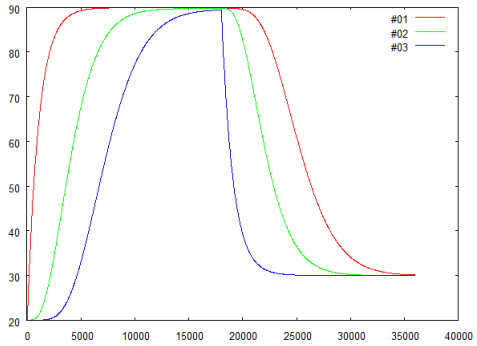
The number of temperature nodes is set to 7, the effective heat conductivity is assumed to be 1 W m^{-1} K^{-1}.

The supply temperature of the tank is set constant to 90 °C, the return temperature is assumed to be 30 °C, and the environment temperature of the tank is set to 20 °C, as defined by three CONST blocks.

The logics implies that the tank is charged for 18000 seconds (5 hours) at a mass flow of of 0.1 kg/s and then discharged with the same mass flow. As long as the value 18 000, defined by a CONST block is greater or equal to the output of the DO block, the GE block outputs one. This signal, multiplied by the constant mass flow rate of 0.1 kg/s by a MUL block gives the mass flow rate at 90 °C into the tank.

The inverse signal of the hot water supply mass flow, generated by the INV block, is used as load mass flow of the tank.

The PLOT block shows the resulting temperature profile in the tank for nodes 1 (top), node 4 (middle), and seven (bottom).



See also Block TANKFM.