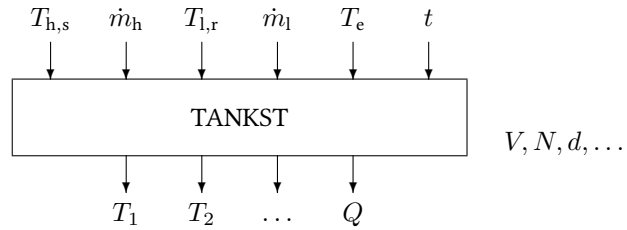


Block TANKST

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

Outputs

- 1 Temperature of node 1 (top) $T_1 / ^\circ\text{C}$
- 2 Temperature of node 2 $T_2 / ^\circ\text{C}$
- N Temperature of node N (bottom) $T_N / ^\circ\text{C}$
- N+1 Energy content of the storage Q / J

Parameters

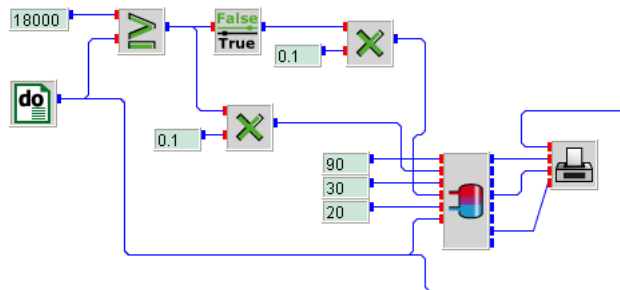
- 1 Tank volume V / m^3
- 2 Number of temperature nodes $N \leq 200$

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

Strings

None

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 $4190 \text{ J kg}^{-1} \text{K}^{-1}$ and a density of 1000 kg/m^3 . The overall heat-loss coefficient is set to $0.5 \text{ W m}^{-2} \text{K}^{-1}$ at an initial tank temperature of $20 \text{ }^{\circ}\text{C}$.

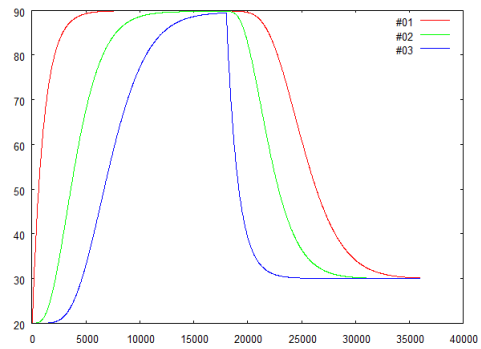
The number of temperature nodes is set to 7 , the effective heat conductivity is assumed to be $1 \text{ W m}^{-1} \text{K}^{-1}$.

The supply temperature of the tank is set constant to $90 \text{ }^{\circ}\text{C}$, the return temperature is assumed to be $30 \text{ }^{\circ}\text{C}$, and the environment temperature of the tank is set to $20 \text{ }^{\circ}\text{C}$, as defined by three [CONST](#) blocks.

The logics implies that the tank is charged for $18\,000$ seconds (5 hours) at a mass flow 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 $90 \text{ }^{\circ}\text{C}$ 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](#).