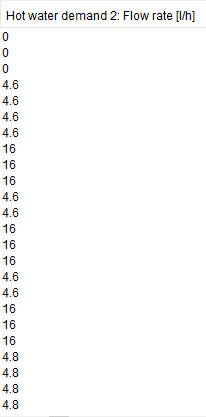
**Important aspects regarding validation**

* On/off controller – if the temperature at the exit of the solar collector (Tcout) is higher than the temperature of layer 8 of the storage tank (last layer exchanging heat with the solar collector) the pump switches on.
* Heat demand for the storage tank

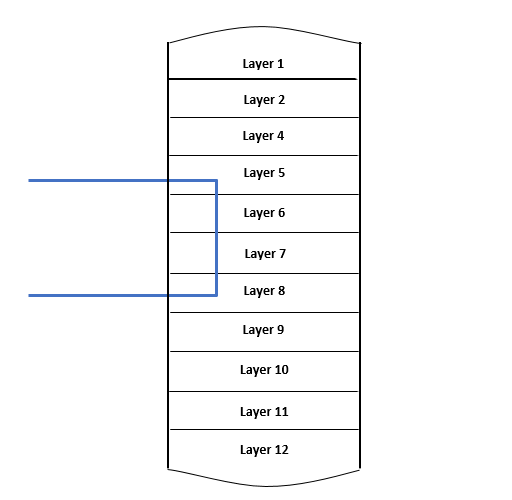
The same flow rate profile every day

** **

* Equations of the storage tank - Based on [1] and [2]

T1 and T12 have higher volume because it includes the bulge.

|  |  |
| --- | --- |
| **Temperature in the layer** | **Equation** |
| T1 | (1) |
| T2,T3,T4,T9,T10,T11 | (2) |
| T5,T6,T7,T8 | (3) |
| T12 | (4) |

****

(1)

(2)

(3)

With

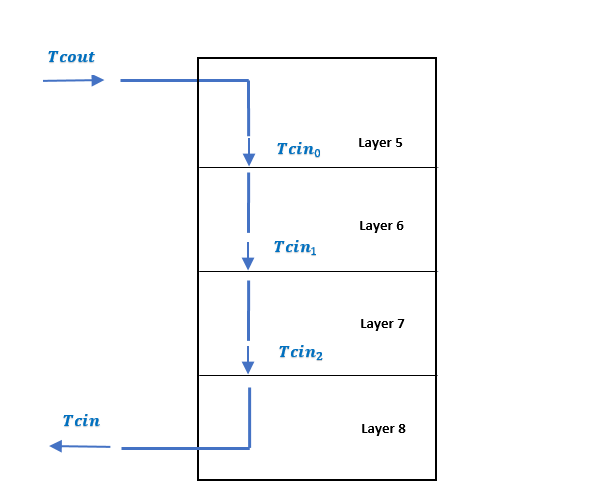
(4)

(5)

(6)

Variables:

(To force the heat to go from the layer below to layer j) (see bibliography).



Bibliography

[1] A. Rahman, N. Fumo, and A. D. Smith, “Simplified modeling of thermal storage tank for distributed energy heat recovery applications,” *ASME 2015 9th Int. Conf. Energy Sustain. ES 2015, collocated with ASME 2015 Power Conf. ASME 2015 13th Int. Conf. Fuel Cell Sci. Eng. Technol. ASME 2015 Nucl. Forum*, vol. 2, no. June, 2015, doi: 10.1115/ES2015-49170.

[2] A. L. Nash, A. Badithela, and N. Jain, “Dynamic modeling of a sensible thermal energy storage tank with an immersed coil heat exchanger under three operation modes,” *Appl. Energy*, vol. 195, pp. 877–889, 2017, doi: 10.1016/j.apenergy.2017.03.092.