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Thermal energy storage

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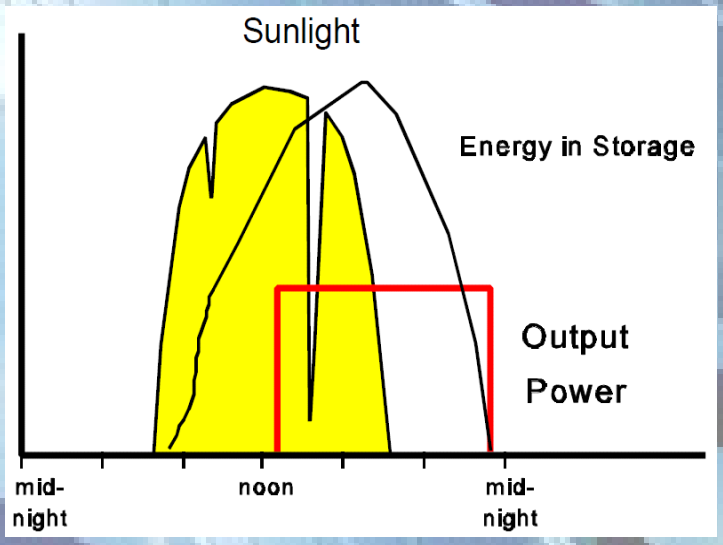
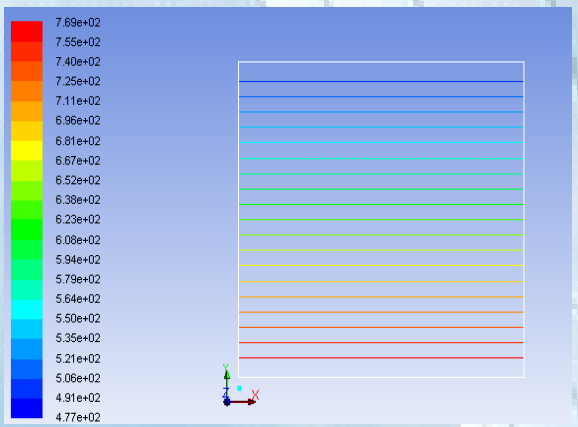
Context

The production of electricity using renewable energy is unpredictable → the storage of this energy llows to adapt the production to the consumption

See opposit, in the ideal case, the outpout power is maximum when the consumption is maximum (noon-midnight)



Data



Opposit: how the temperature profile looks like without convection

Simulation of the flow in a cylindrical reservoir of melted salt with two heat exchangers («heater» at the bottom, «cooler» at the top)

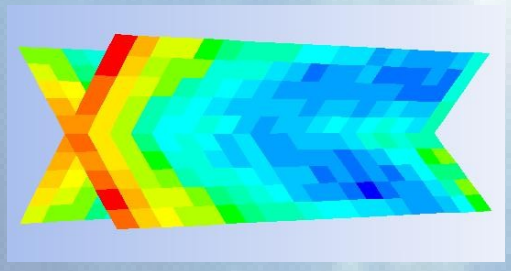
Chosen fluid is: LiF-NaF-ZrF_4 **(42%-29%-29%)**

$$\frac{E}{V} = 1{,}39.10^{9}\, Jm^{-3}$$

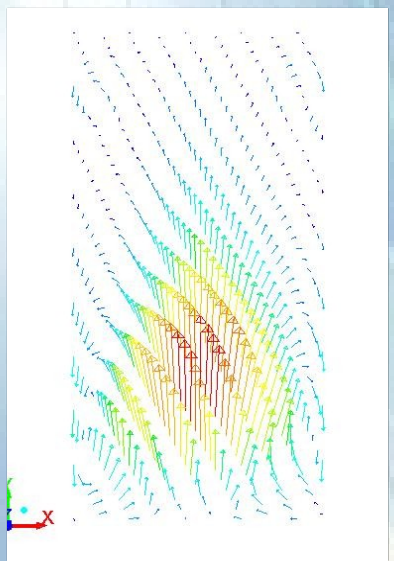
Results

We observe a convection flow which brings the hot fluid to the top of the tank, increasing the efficiency of the exchangers

Temperature profile



Velocity profile



Conclusion

The use of only one reservoir divide the losses by 2.
This process can store one day of energy if the power of the power plant is 10MW and the tank is 10,5m high and 5,3 as diameter.