

Economical relocalisation in our global approvisionnement chain crisis era

Adaptation of existing water storage to solar thermal

The Spray Tube as ersatz to Baffle Plate

Former research : the simple Spray Tube

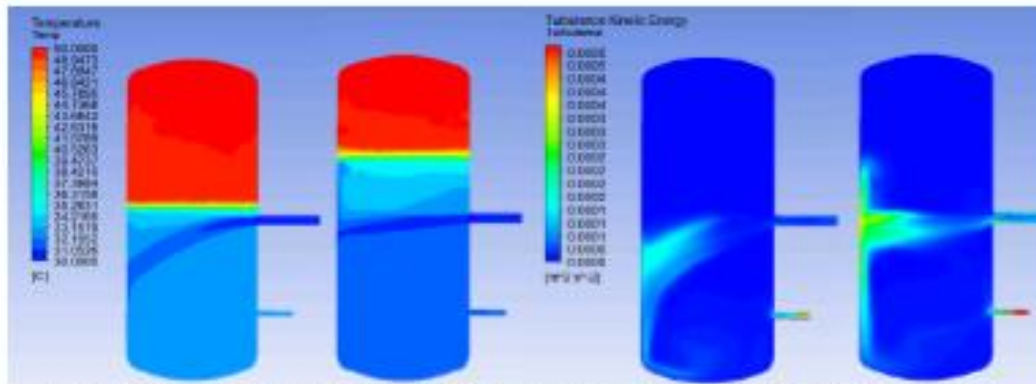


Abbildung 27 Temperatur (links) und turbulente kinetische Energie (rechts) nach 1 Stunde Einströmung mit 0,22 m/s (jeweils links) und 0,23 m/s (jeweils rechts Bild) über ein 2 Zoll Rohr ohne Strömungsbehinderung auf halber Höhe des Speichers.

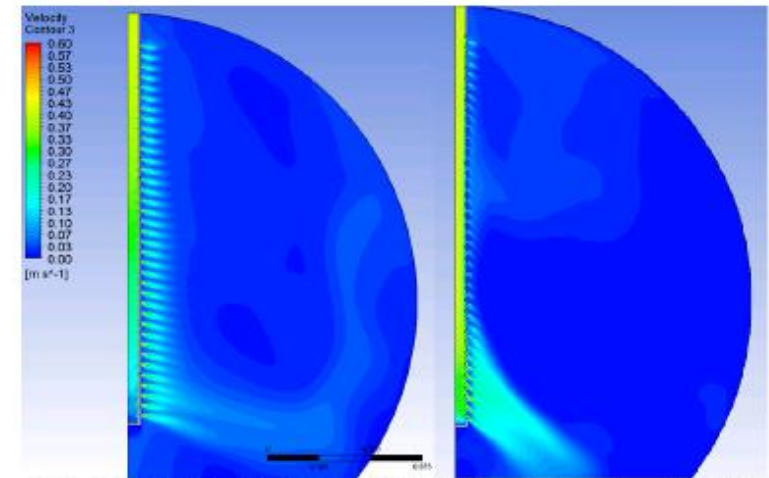
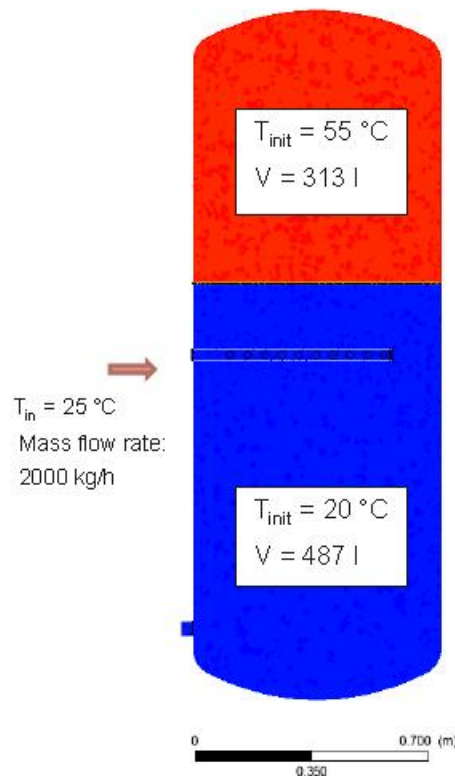


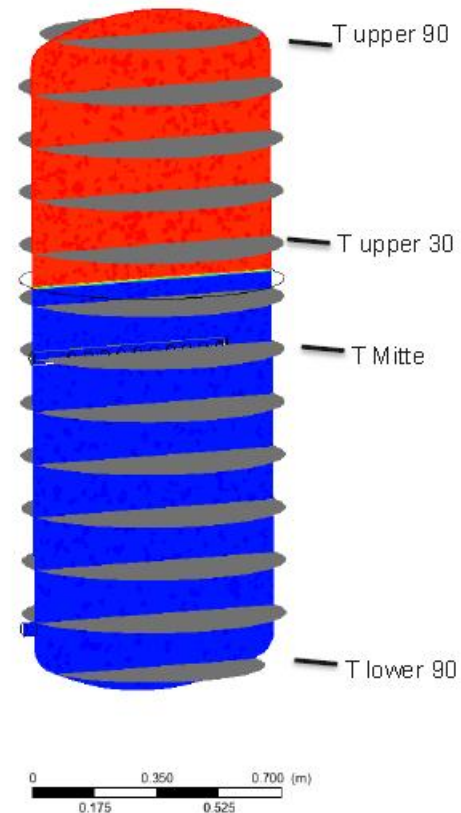
Abbildung 34 Geschwindigkeit verteilt um die horizontale Ebene des Sprühdrahts mit Lochdurchmesser 8 mm (links) und Lochdurchmesser 18 mm (rechts).

Initial and boundary conditions and planes for temperature calculation



To remember later

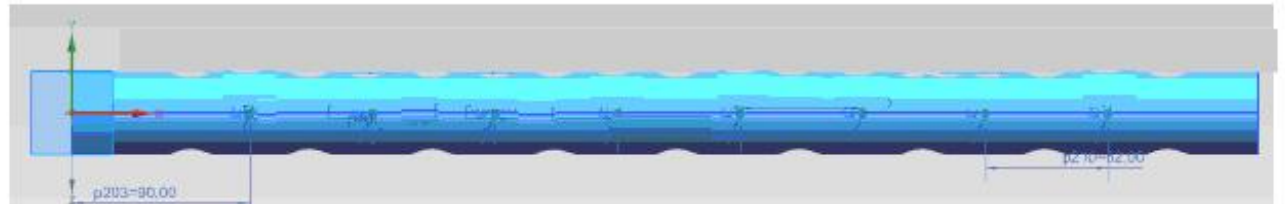
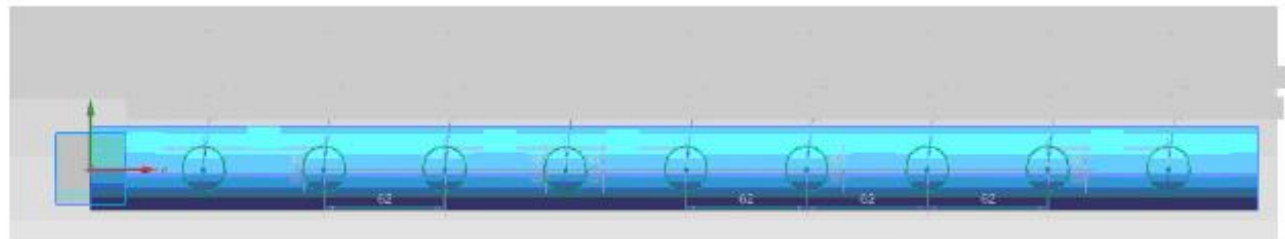
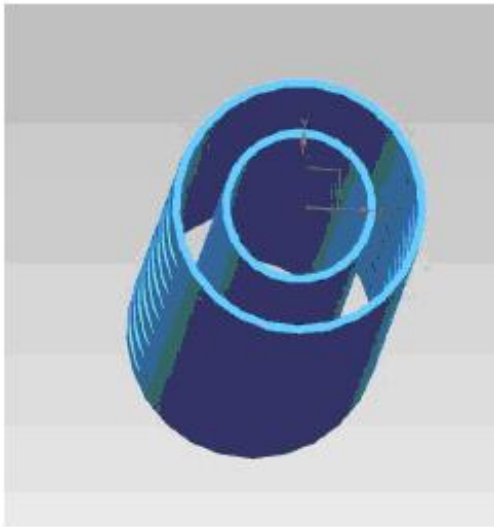
- 2000 L/h
- $\Delta T\ 5\text{ °K}$
- $V_{tot}\ 800\text{L}$



Results : Bad (see later)

New try : the Tube-in-Tube Spray Tube

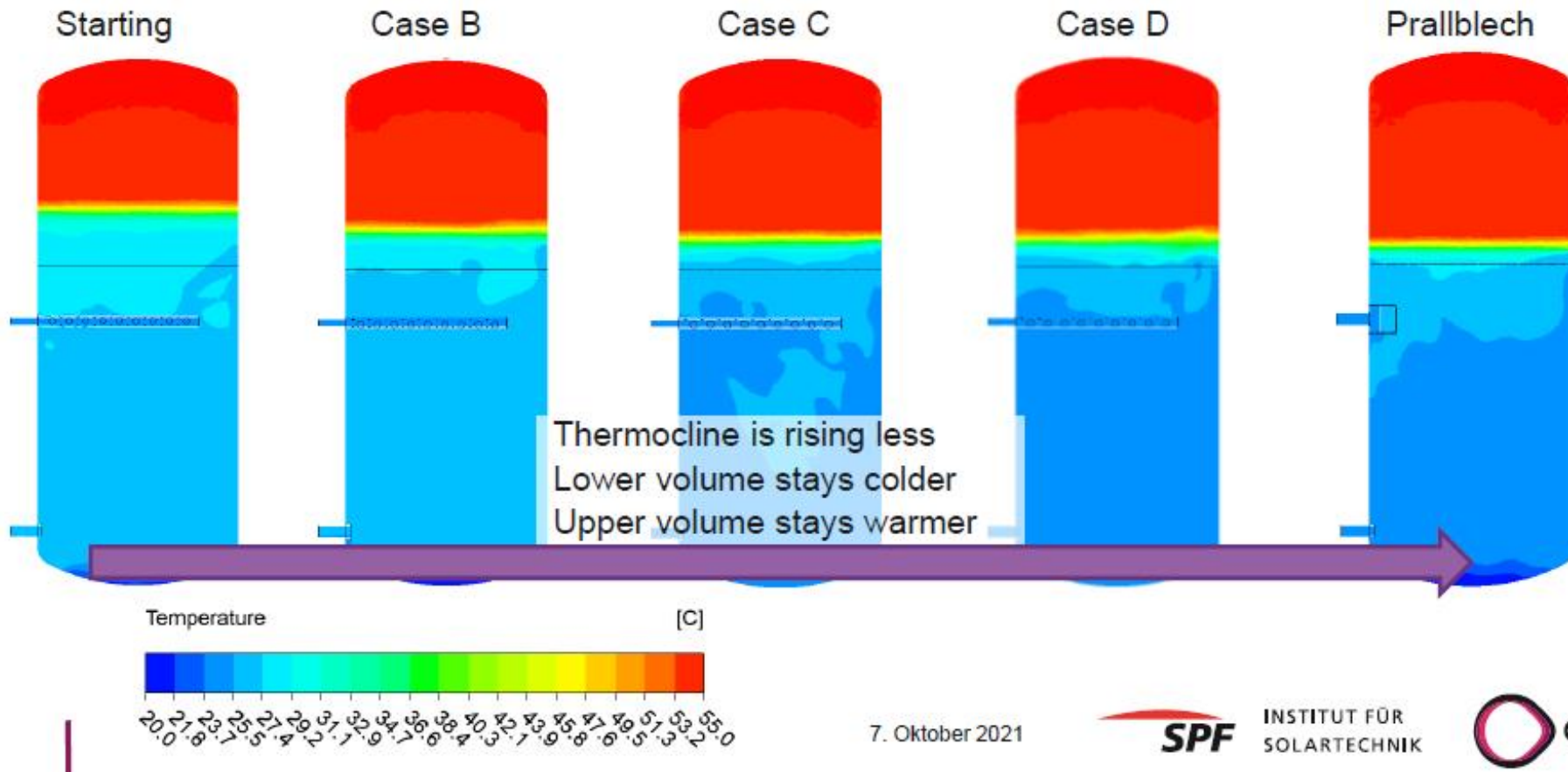
"Starting Tube in Tube" design



Some model testing

Part 2 – Comparison with baffle plate Simulation

Storage temperatures (after 30 Minutes)



7. Oktober 2021

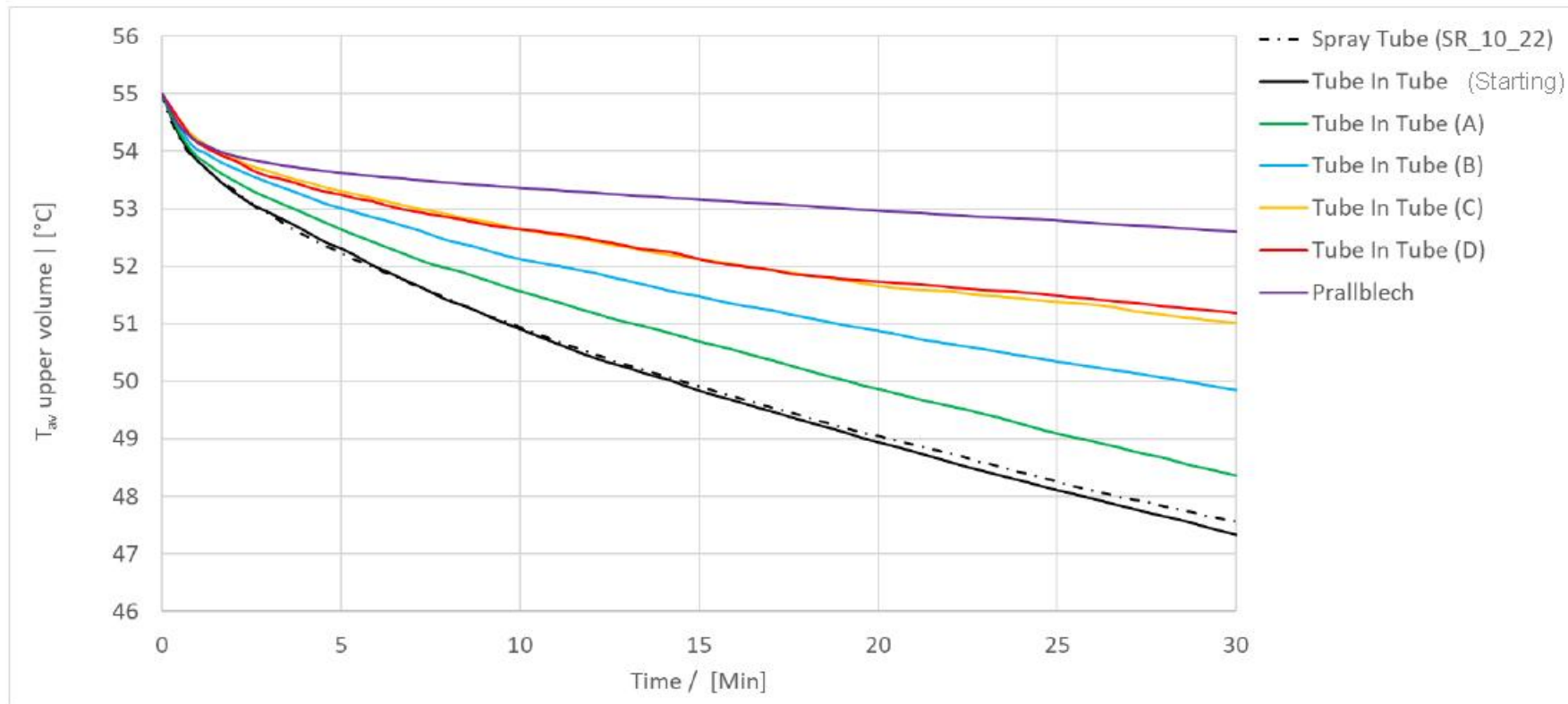


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And results

Cooling of upper volume – Comparison between baffle plate and "TubeInTube" layouts



Former single Spray Tube

In the beginning, depressive results

	Average T upper volume	delta T 20%	T _{drop} upper volume	Improvement vs spraytube
	°C	Min	K	
Without spraytube	41.53	8.46	13.47	
SR 10 22.5	47.56	20.33	7.44	
TubeInTube – Starting	47.34	20.02	7.66	-3.0%
TubeInTube – Case A	48.36	25.66	6.64	10.8%
TubeInTube – Case B	49.85	> 30	5.15	30.8%
TubeInTube – Case C	51.02	> 30	3.98	46.5%
TubeInTube – Case D	51.19	> 30	3.81	48.8%
Baffle plate	52.60	> 30	2.40	67.7%
only heat conduction	53.94	> 30	1.15	84.5%

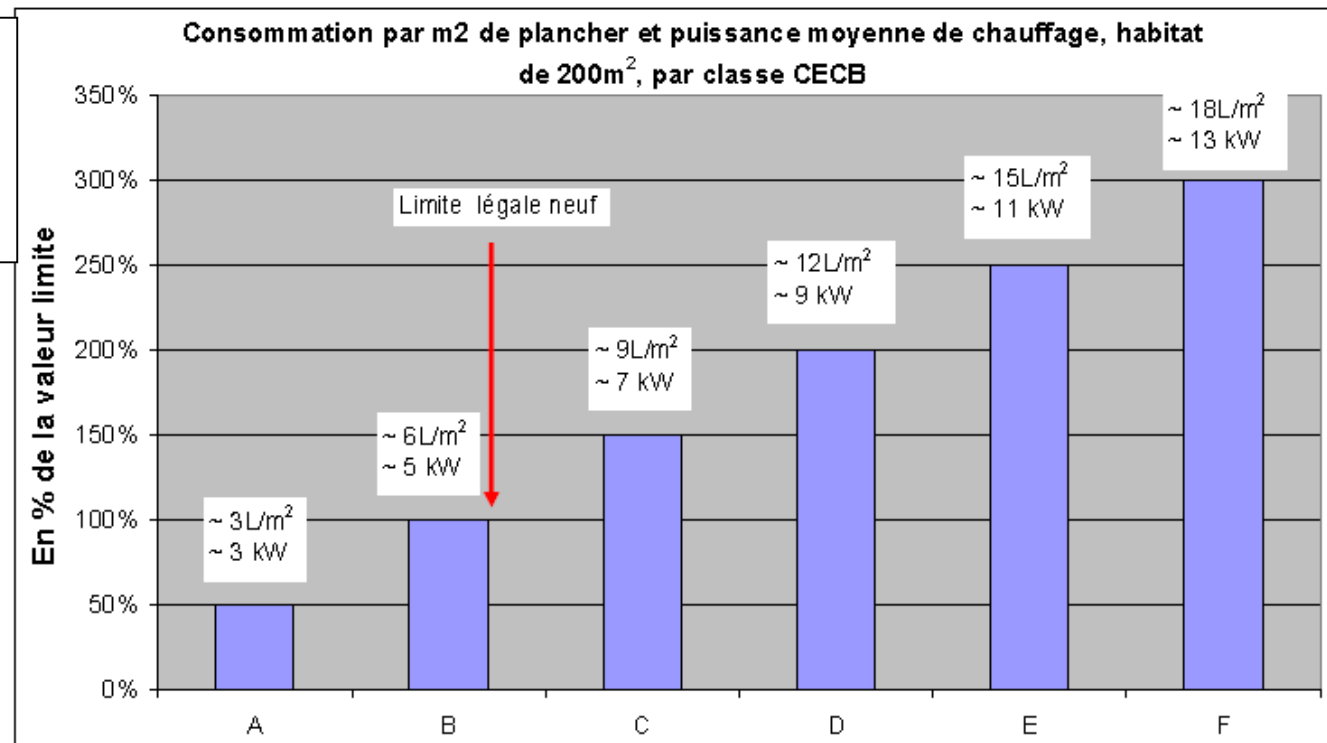
Large improvement with holes in outer tube lowered downwards

More improvement when holes in inner tube are upwards directed, only

To baffle plate : ~47 / 68 => - 30% => baffle plate is better (Joseph Jenni still right :-)

BUT (remember) : 2000 L/h, ΔT 5°K, Vtot 800L => What does it mean ?

Floor heating or heater power distribution/injection



2000 L/h is equivalent to heating system

11 kW with $\Delta T 5^\circ K \Rightarrow$ until CECB E for individual house

BUT $\Delta T 5^\circ k$ only for floor heating (f. ex. 28/22) \Rightarrow not possible for CECB E. Only for A, maximal B

23 kW with $\Delta T 10^\circ K \Rightarrow \gg$ CECB G+ for individual house \Rightarrow floor heating is 35/25 OK

Or lower flow than 2000 L/h (if heating power \ll 23 kW \Rightarrow perfect

Solar thermal injection

Surface installation		m2->	6	12	18	24	30	36	48	60	72	84	96
Flow			[L/h]	[L/h]	[L/h]	[L/h]	[L/h]	[L/h]	[L/h]	[L/h]	[L/h]	[L/h]	[L/h]
High-flow	L/h m2	35	210	420	630	840	1050	1260	1680	2100	2520	2940	3360
Low-flow	L/h m2	15	90	180	270	360	450	540	720	900	1080	1260	1440
Max Power transfered			[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]
Sommer	W/m2	1000	4,8	9,6	14,4	19,2	24	28,8	38,4	48	57,6	67,2	76,8
Winter	W/m2	600	2,9	5,8	8,6	11,5	14,4	17,3	23,0	28,8	34,6	40,3	46,1

Big accus => more than 1 Spray-Tube

Prices ?

Inlet Solding

Offer from a iron-solding firm from Yverdon : 600.- for 6-9 iron inlets 1 1/2"
(to be confirmed)

Tube-in-Tube Spray Tube

A Tube-in-Tube, with 1 1/2" inlet, heat resistant plastic (like Geberit for hot water), material : ~ 50 .- /piece ?
+ plate heat exchanger

(2 projets in DIY on the way to assess prices)