



AKVATERM



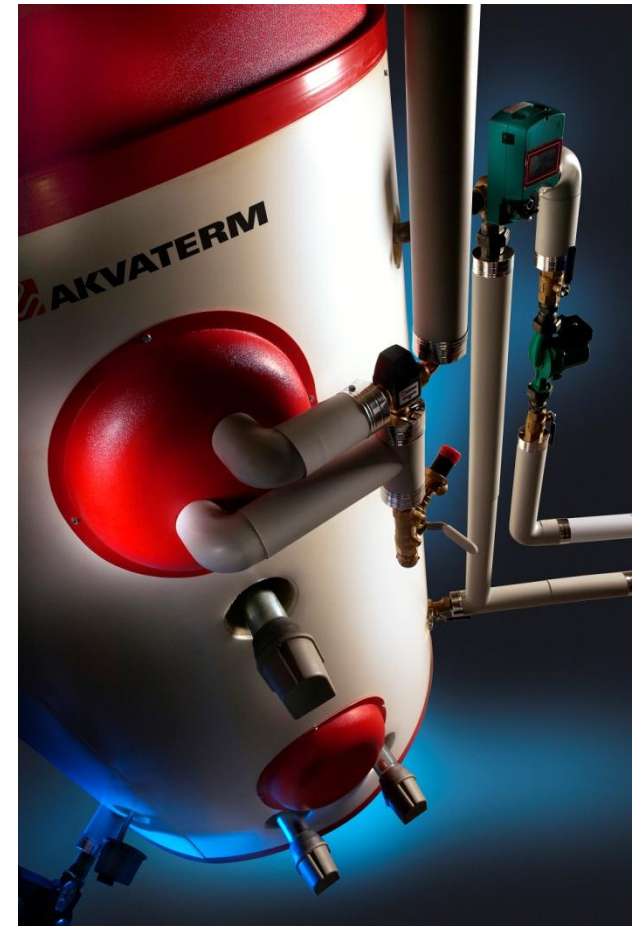
Cambridge Heat10, 2.12.2010

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Akvaterm



- Akvaterm is a European accumulator manufacture
- Concentrated in heat accumulation and cold storage since 1993, high knowhow in heating and heat distribution
- Production: well insulated accumulator tanks, cold tanks and heatexchanger coils
- No heating appliances produced to keep our clear focus



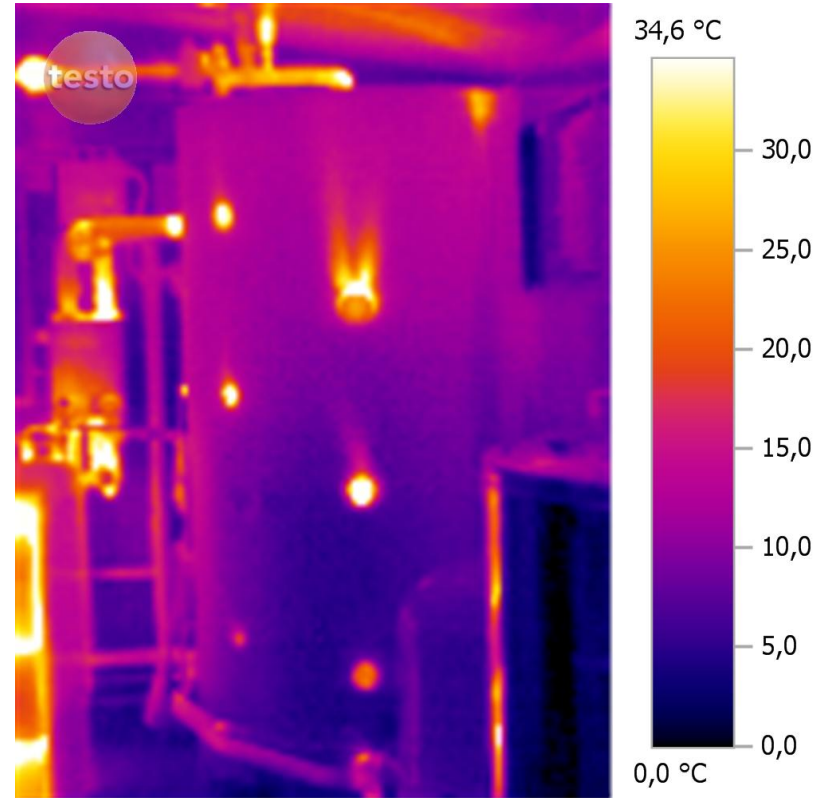
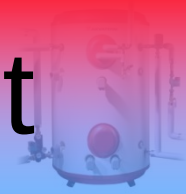
Importance of insulation



- The biggest significance in accumulating is with insulation
- The higher the flow the bigger losses.
 - In pipes with flow the losses to surface area are bigger than at still areas.
- Flow on gravity to pipes will also add to heatlosses.
 - E.g. Connections to expansion from the top.

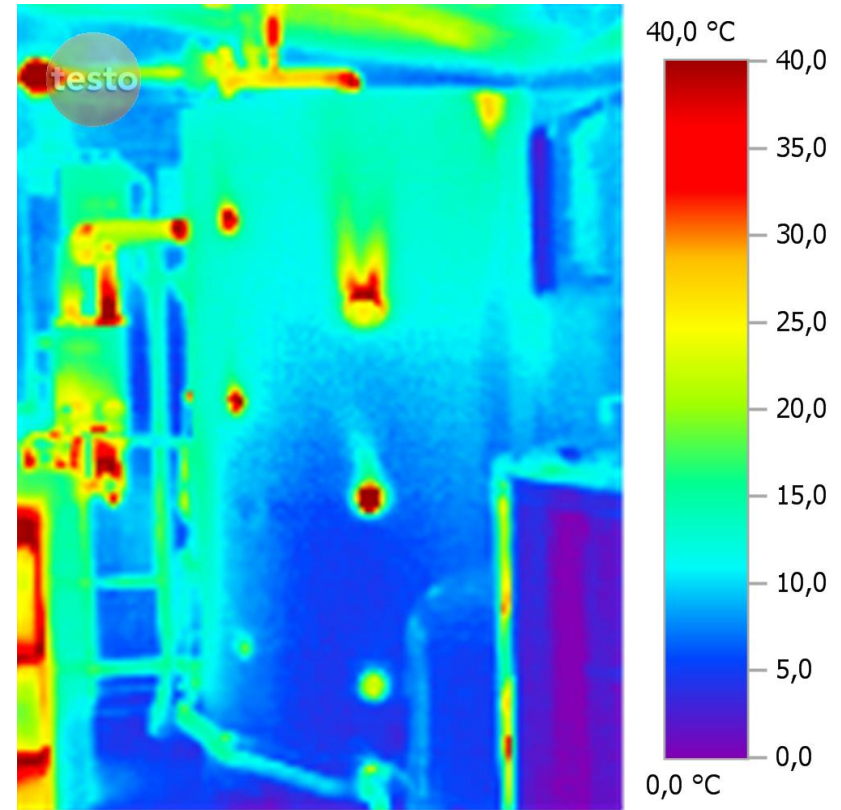
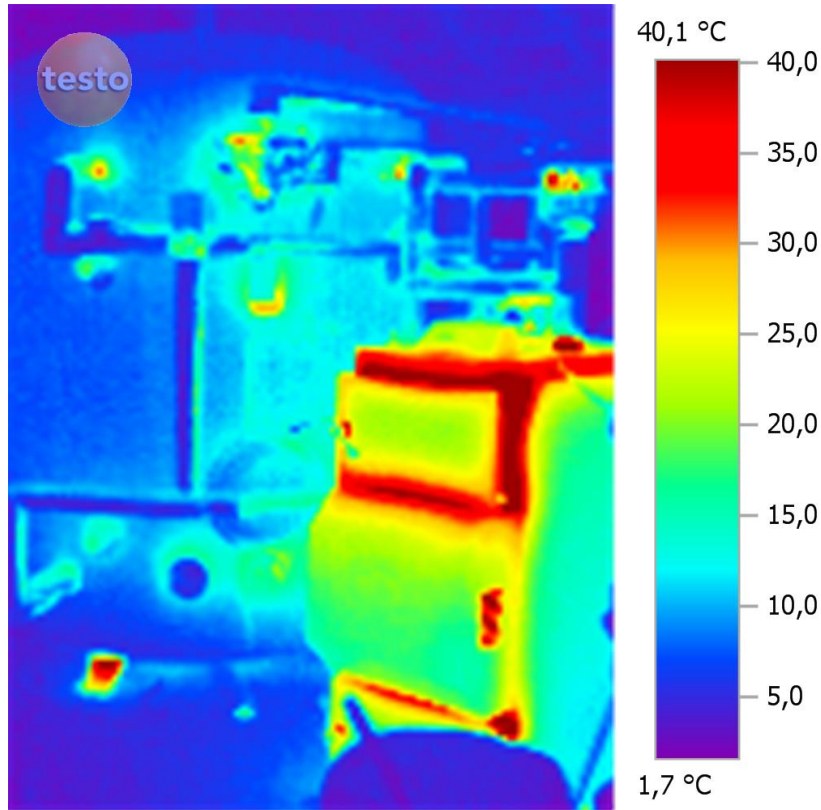
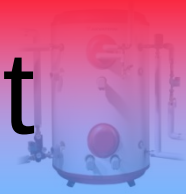


Accumulators when hot



- Insulation thickness in both 100 mm, AKVA with polyurethane loses much less than the accumulator with plastic foam.

Accumulators when hot



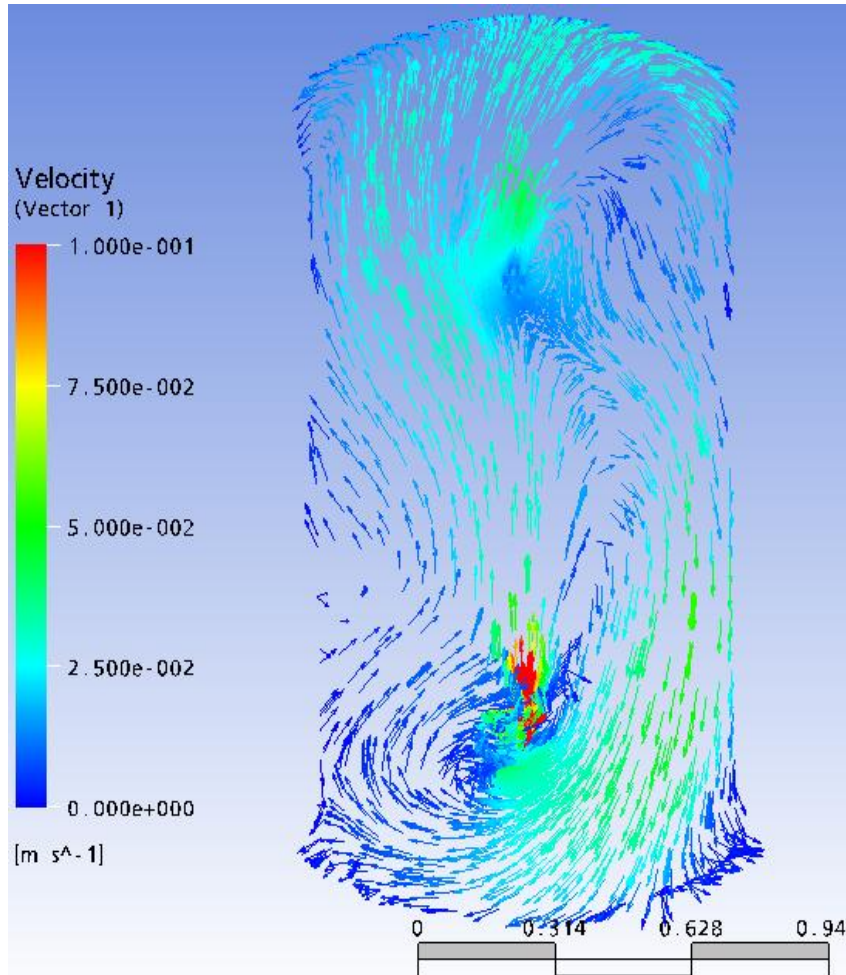
- Same picture with contrast colours.

Insulation and Temperature



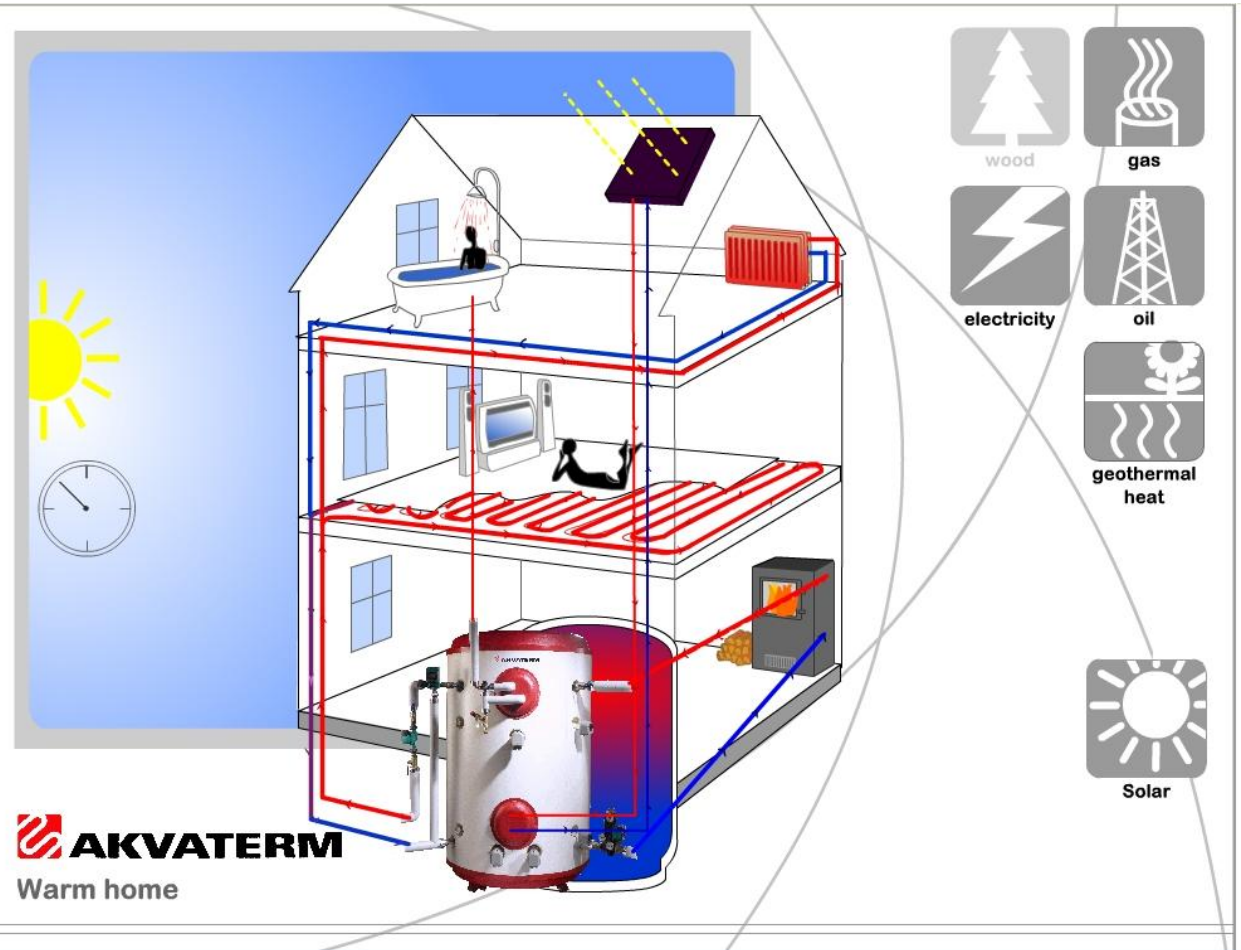
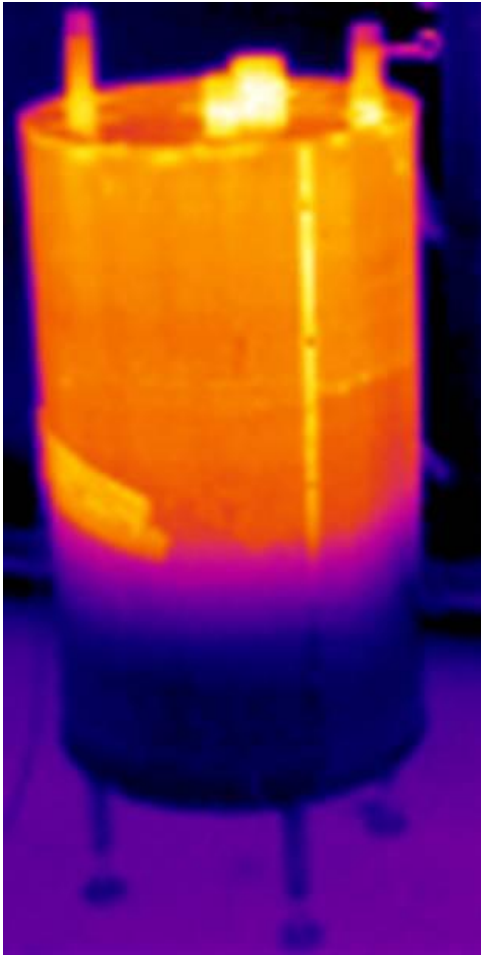
COMPARISON	Heatloss (W)	EUR / a	kWh / year	Surface area	Insulation (mm)	Delta T	λ (W/m*K)
300 liter DHW cylinder	165,22	115,79	1447,37	5,36	50	55	0,028
Plastic foam insulated 750	331,58	232,37	2904,64	7,54	100	55	0,080
1500 l = 2 x 750	663,16	464,74	5809,27	15,07	100	55	0,080
AKVA 1500	167,82	117,61	1470,10	10,90	100	55	0,028
AKVA 2000	196,42	137,65	1720,68	12,75	100	55	0,028
AKVA 2000 and 300 liter DHW cylinder	361,65	253,44	3168,05	18,12		55	0,028
STRATIFICATION							
Bottom:							
3/4 AKVA 2500 ΔT 10	29,69	20,81	260,07	10,60	100	10	0,028
Top:							
1/4 AKVA 2500 ΔT 65	64,32	45,08	563,48	3,53	100	65	0,028
	94,01	65,88	823,55	14,14	100		0,028

Stratification of heat



- Feeding heat to top maintains stratification, heat to lower parts would lose stratification
- Different temperatures can be utilised with baffle plate and connections at right position.
- Utilising lower temperatures reduces heating costs
- Annually solar can provide a lot of low temperature kWh, utilising it only to domestic hot water reduces gain to a fraction.

Utilising the heat



Sizing



- Capacity depends on the heat demand of the house
- Going to low temperatures and small sizes, volume has to grow.
- Combining different sources becomes sensible for best overall performance.
- Sizing in kWh makes the planning easier

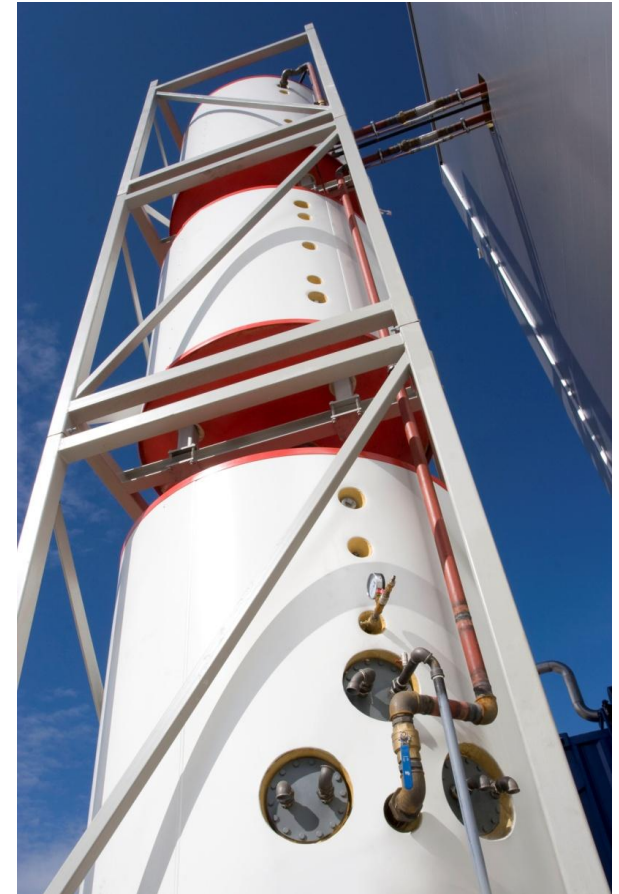
Accumulator size in kWh

<i>liters</i>	deltaT50		deltaT30		deltaT10	
	kWh	minutes in shower	kWh	minutes in shower	kWh	minutes in shower
240	13,7	29	8,2	17	2,7	6
500	28,5	59	17,1	36	5,7	12
750	42,8	89	25,7	53	8,6	18
1000	57,0	119	34,2	71	11,4	24
3000	171,0	356	102,6	214	34,2	71
e.g.	92C - 42C		72C - 42C		52C - 42C	

Some installations



Winter sports arena cooling and heat recovery



Biomass CHP-accumulation
at a factory

Some installations

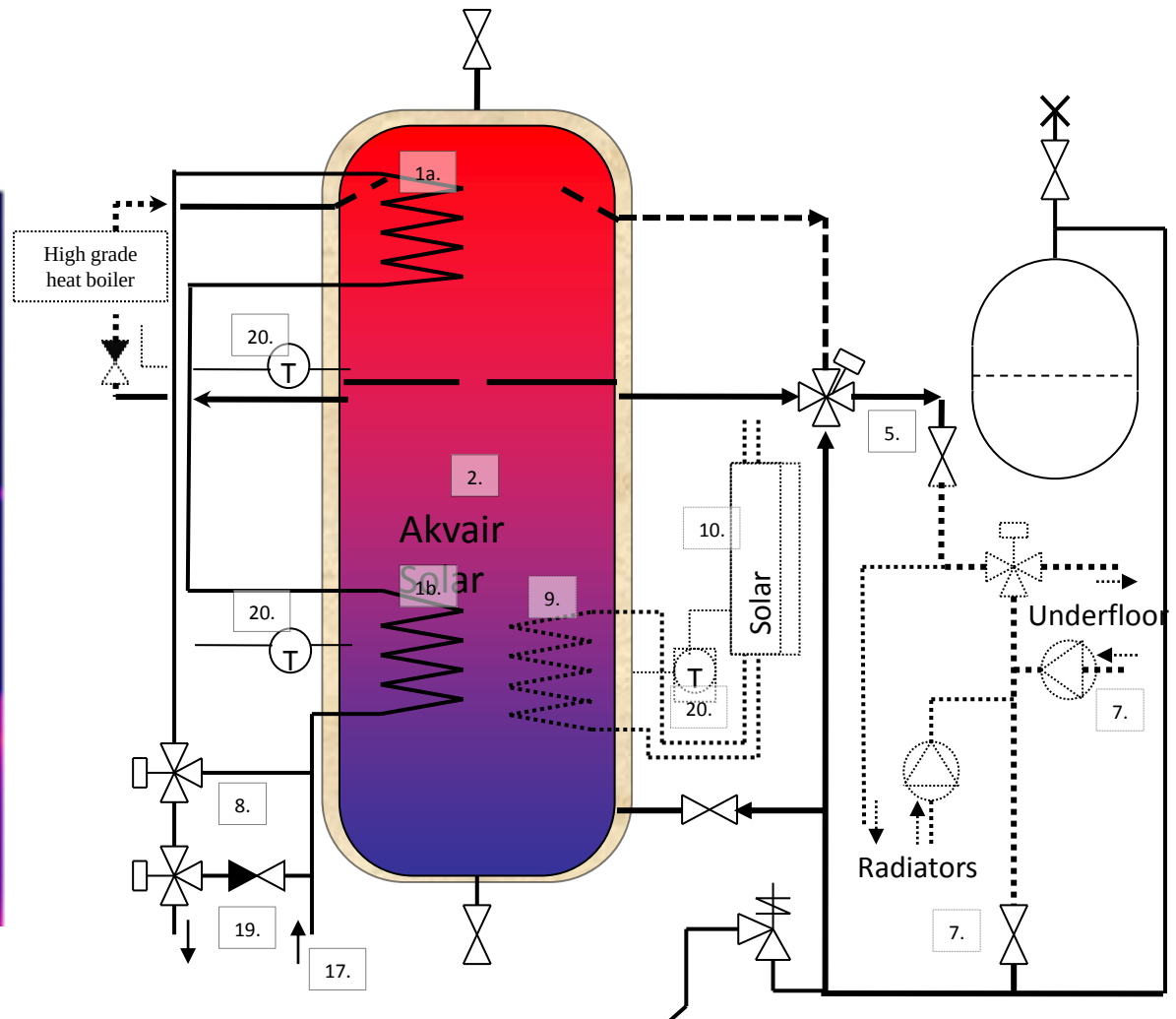
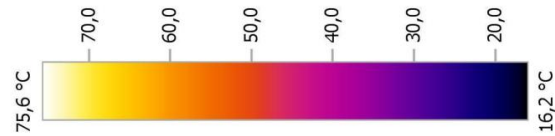


Heat recovery from meat refrigeration providing heat to offices and underfloor of refrigerated spaces to prevent slipping on frozen floor



Kitchen cooker providing plenty of heat combined to a boiler for backup

Heat transfer



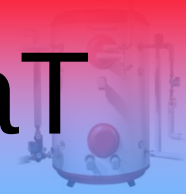
Effect of insulation and deltaT



	W	s insulation (m)	ΔT	T outside	T tank	c	A (m ²)
2500 w. 1 cm	1905	0.01	55	20	75	0.028	12.37
Akva 2500	52	0.10	15	60	75	0.028	12.37
Akva 2500	209	0.10	55	20	75	0.028	12.37
Akva 2500	333	0.10	75	0	75	0.028	12.37
Akva 2500	554	0.10	105	-30	75	0.028	12.37

Steel plate	W	s (m)	ΔT	T outside	T tank	C	A (m ²)
Ø100	2592	0.03	55	20	75	45.00	0.03
Ø200	10367	0.03	55	20	75	45.00	0.13
Ø300	23326	0.03	55	20	75	45.00	0.28

Energy stored with deltaT



deltaT 30 is e.g. tank at 72, output at 42

Energy (kWh)	deltaT	volume (l)	volume (m ³)	c	Minutes in shower
8.2	30	240	0.24	1.14	17
17.1	30	500	0.5	1.14	35
25.7	30	750	0.75	1.14	53
34.2	30	1000	1	1.14	71
102.6	30	3000	3	1.14	214

deltaT 9 is e.g. tank at 51, output at 42

Energy (kWh)	deltaT	volume (l)	volume (m ³)	C	Minutes in shower
2.4	9	240	0.24	1.14	5
5.1	9	500	0.5	1.14	11
7.7	9	750	0.75	1.14	16
10.3	9	1000	1	1.14	21
30.8	9	3000	3	1.14	64

Sizing for Solar



SOLAR

Solar SQM for volume

Solar apperture area per coil

Liters	80 l/sqm	100 l/sqm	120 l/sqm		coil sqm	appereture area for coil (sqm)
240	3.00	2.40	2.00	6 m	1.2	6
300	3.75	3.00	2.50	LK35	2.4	12
500	6.25	5.00	4.17	Solar	2.4	12
750	9.38	7.50	6.25	LK45	3.2	16
1000	12.50	10.00	8.33	14.5 m	3.7	18.5
1500	18.75	15.00	12.50	LK60	4.8	24
2000	25.00	20.00	16.67	LK75	6.4	32
2500	31.25	25.00	20.83	LK80	7.2	36
3000	37.50	30.00	25.00	LK85	7.4	37
4000	50.00	40.00	33.33	LK100	9.6	48
5000	62.50	50.00	41.67	LK120	12.0	60
				LK140	14.4	72
				LK160	16.8	84