

Energy Labelling of factory made systems

Deliverable D3.4 – Part 2: Annexes

CENER

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Version: 2.1

Date: 26/04/2012

Final version

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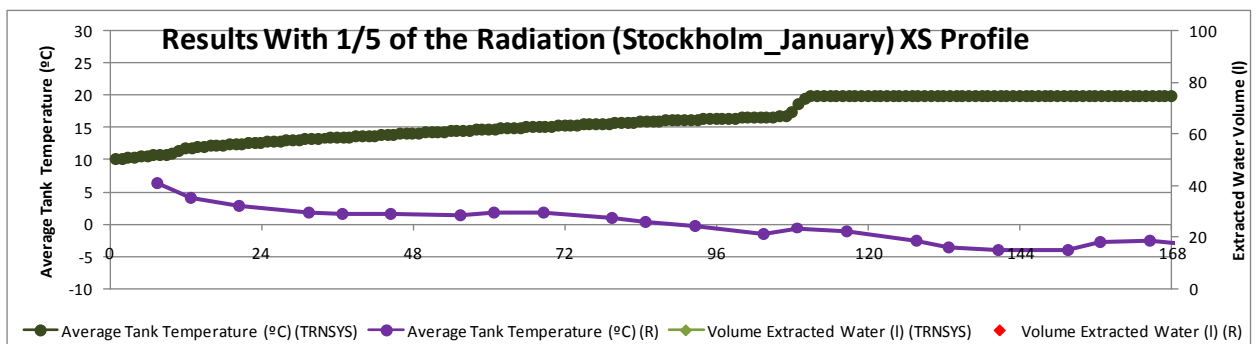
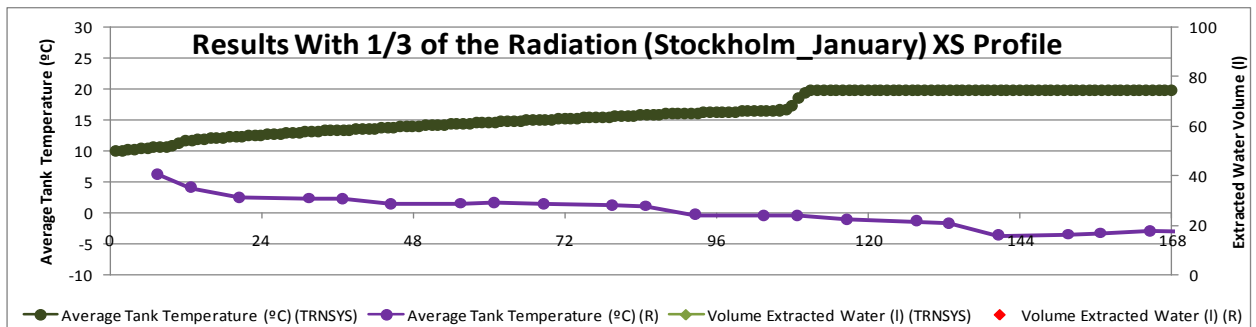
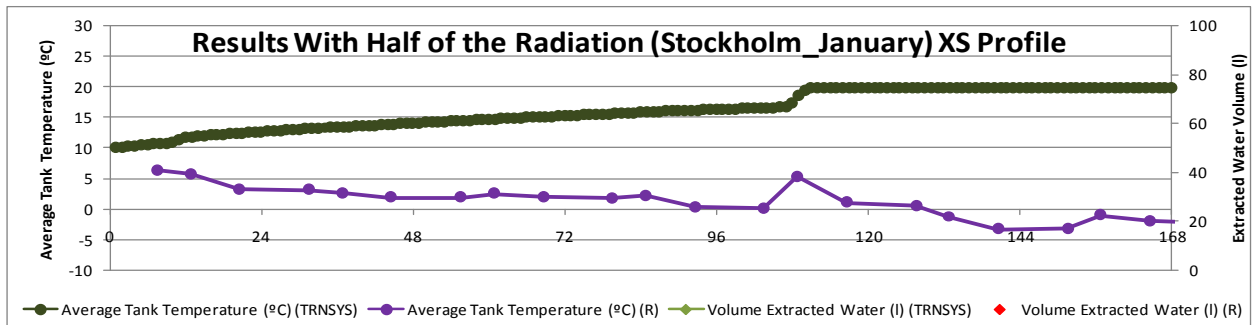
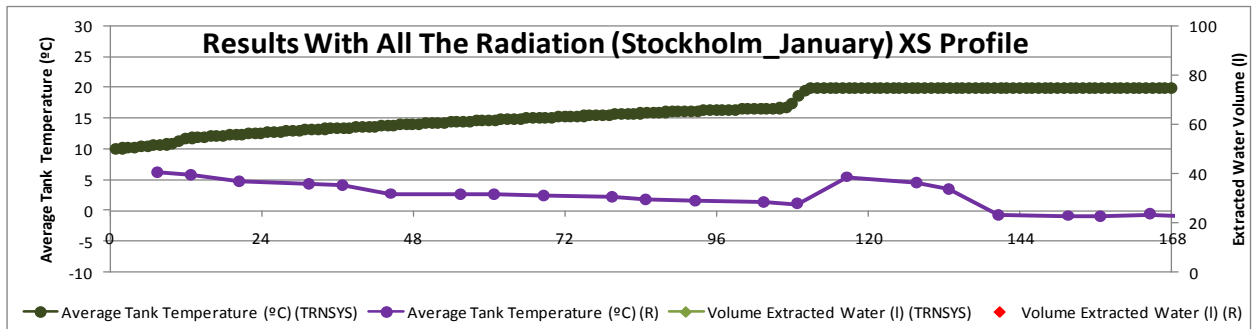
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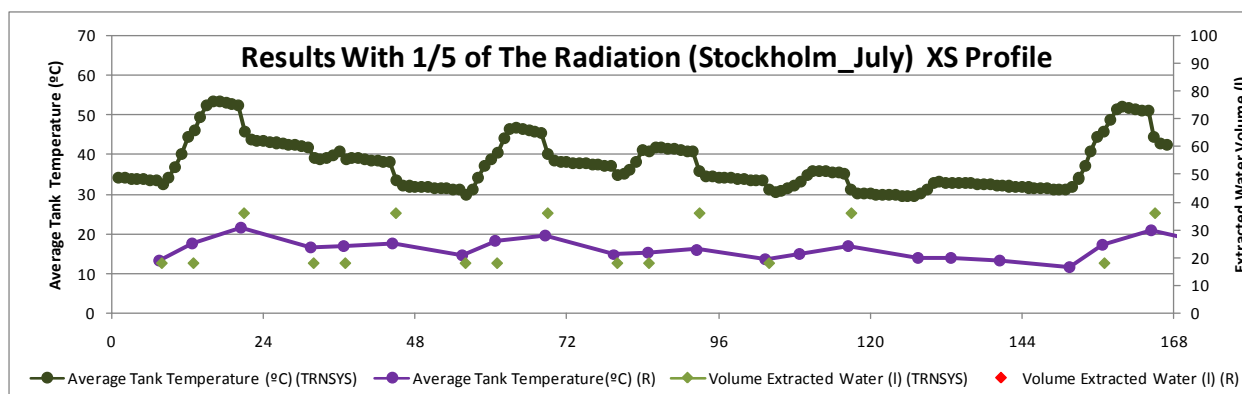
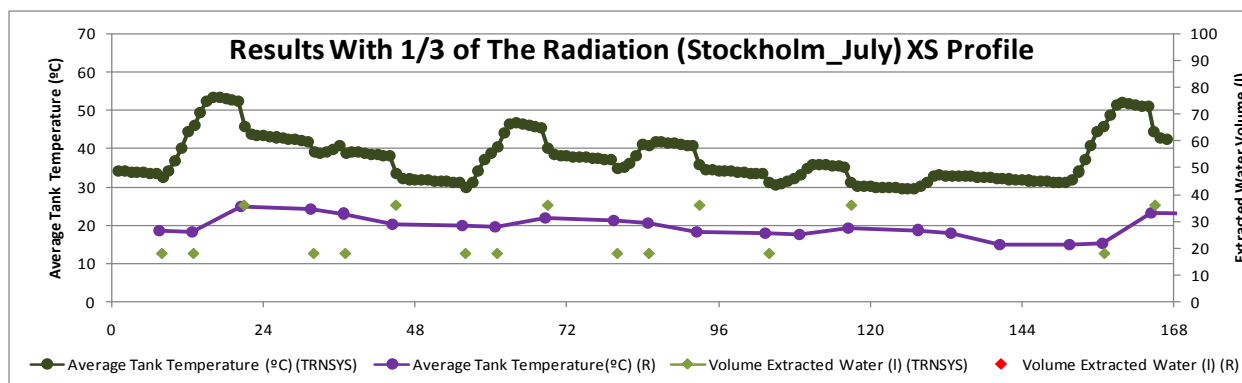
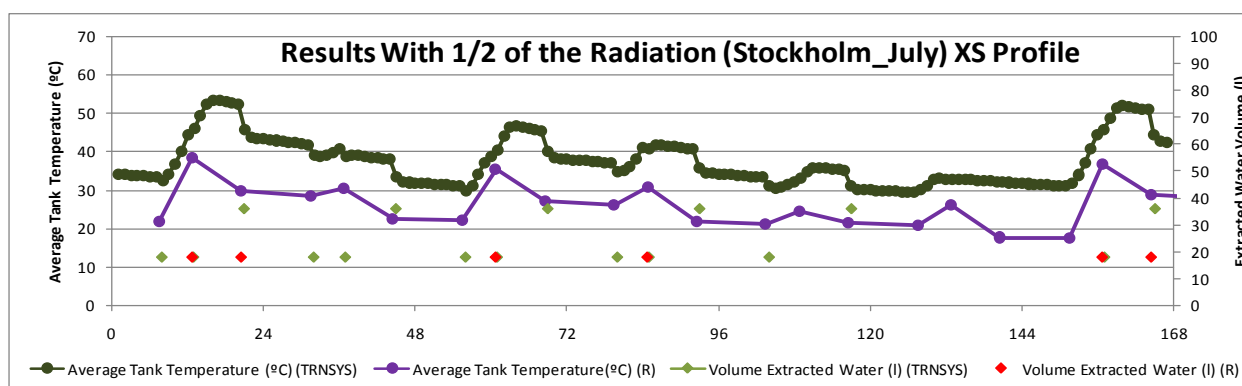
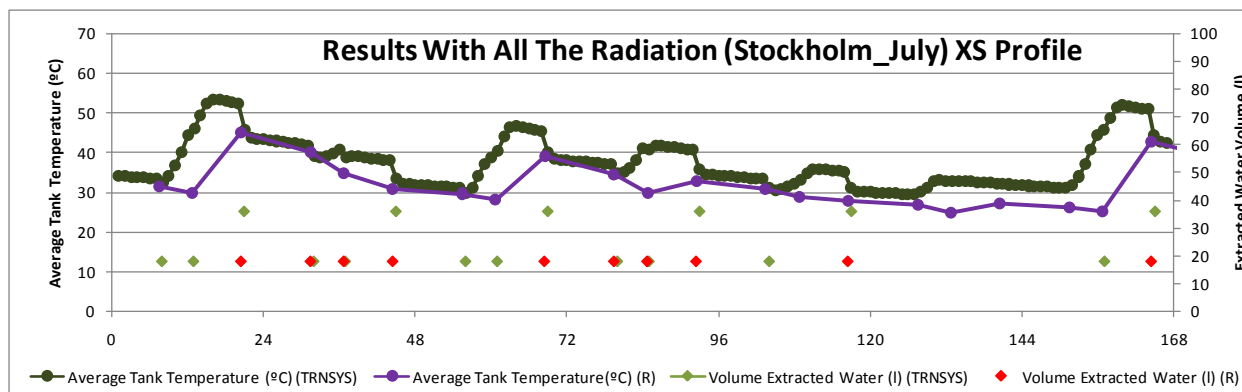
1 ANNEX 1 - CSTG LTPP result validation: comparison R vs. TRNSYS

1.1 Stockholm results

1.1.1 January 1st week

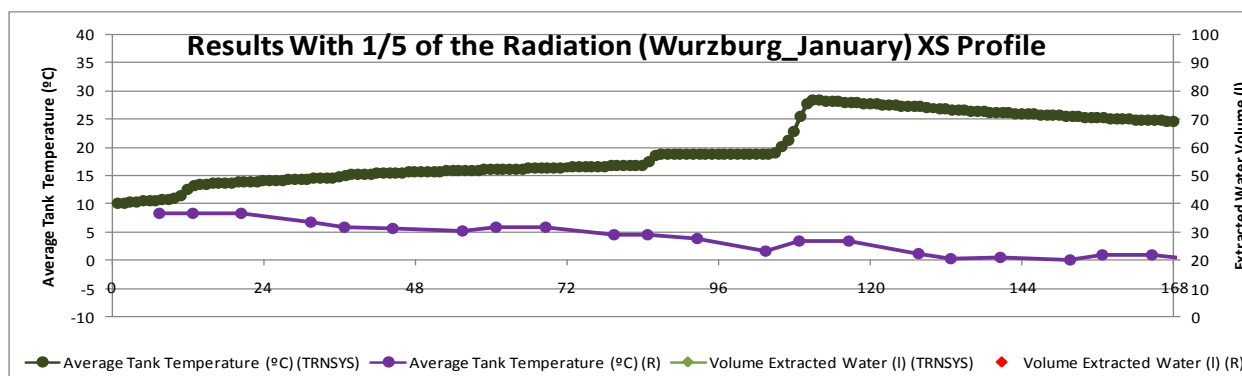
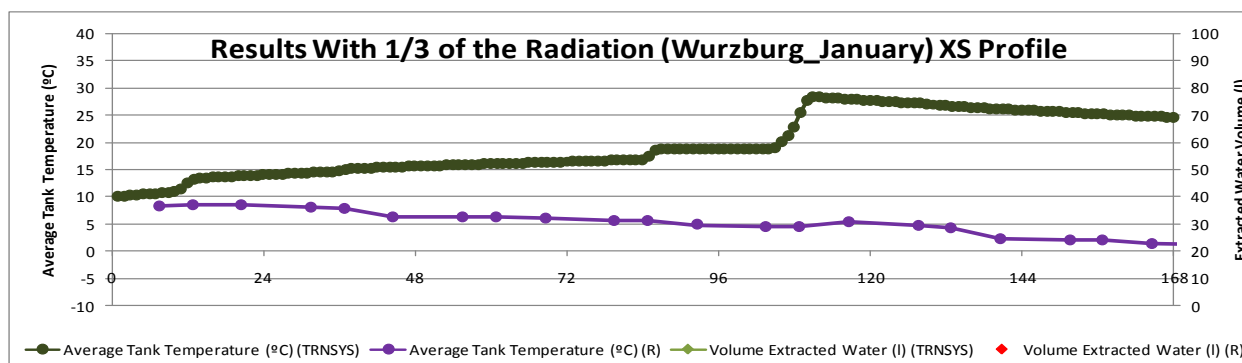
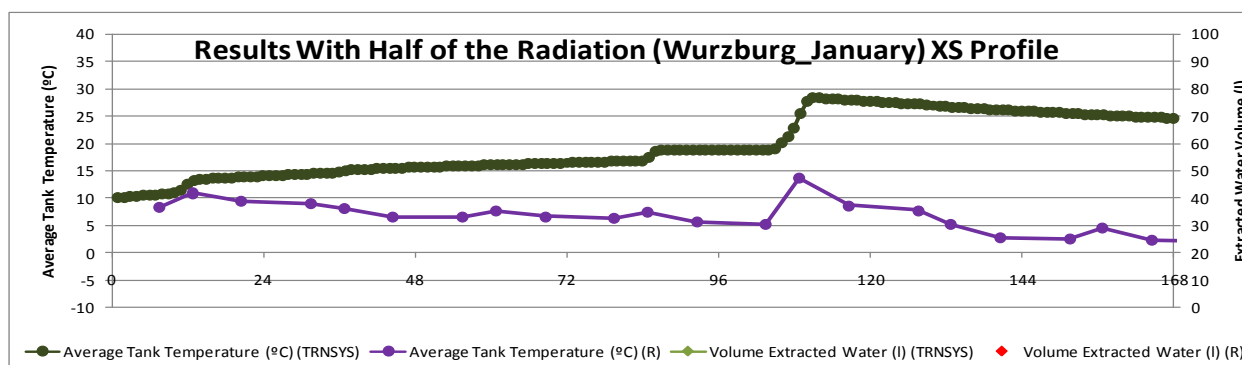
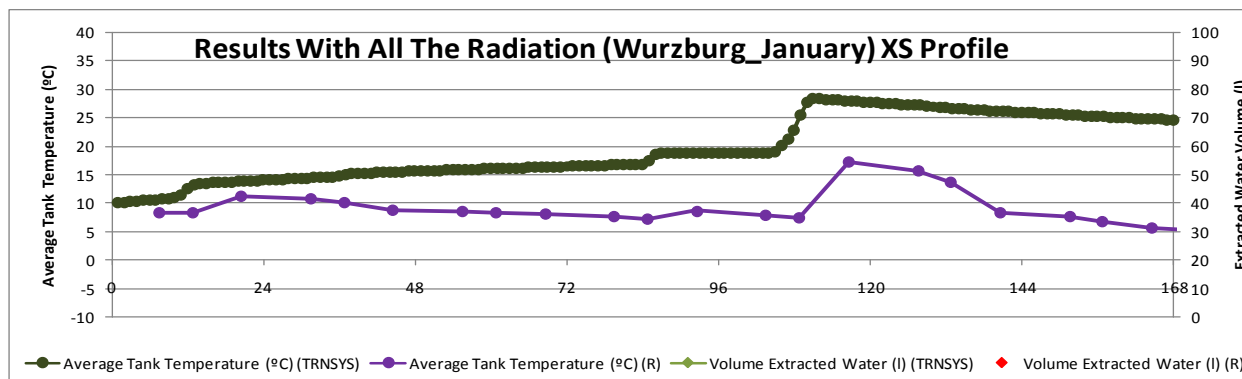


1.1.2 July 1st week

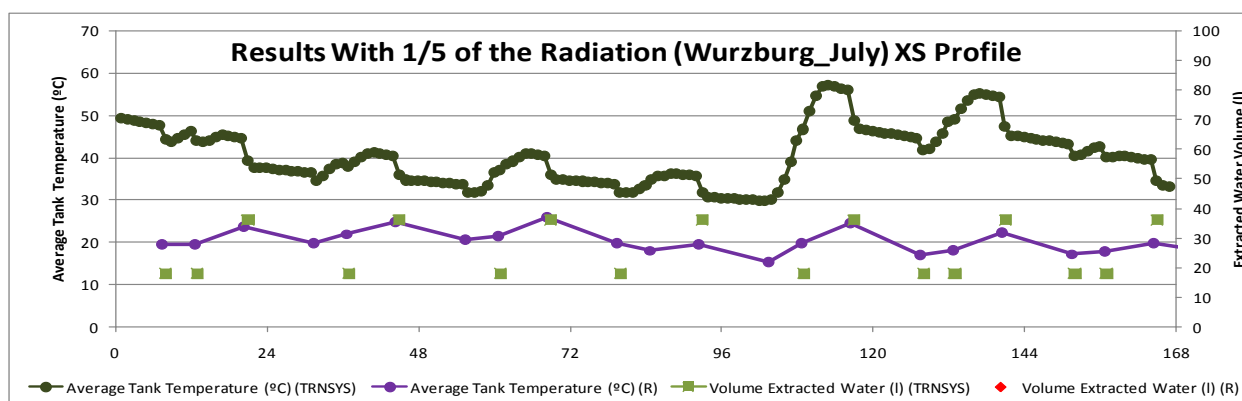
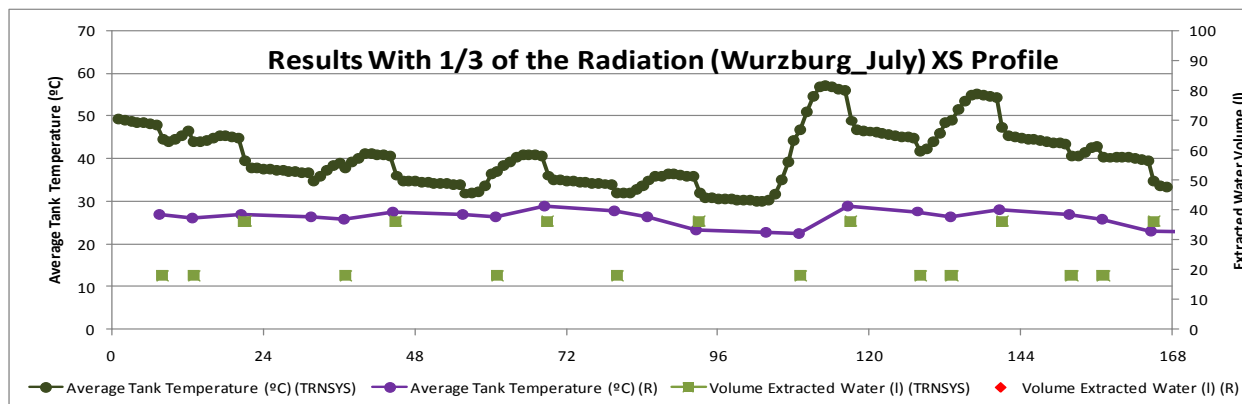
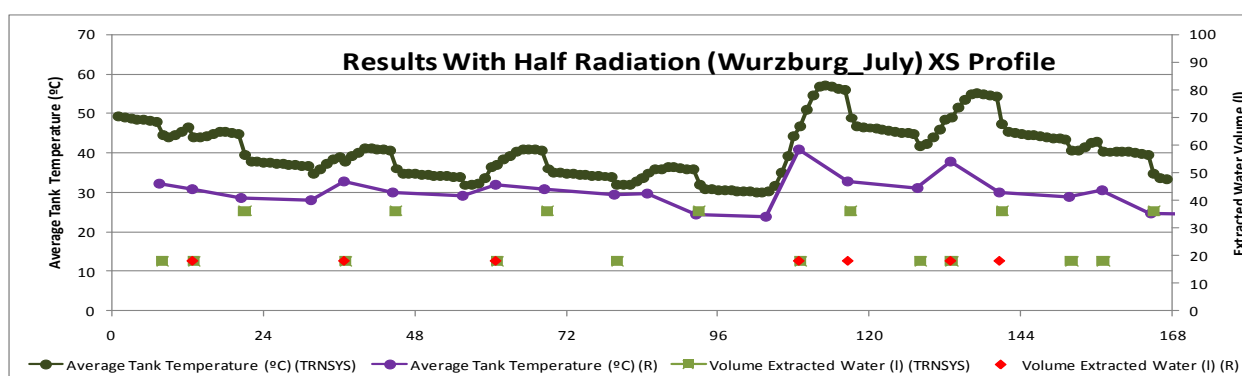
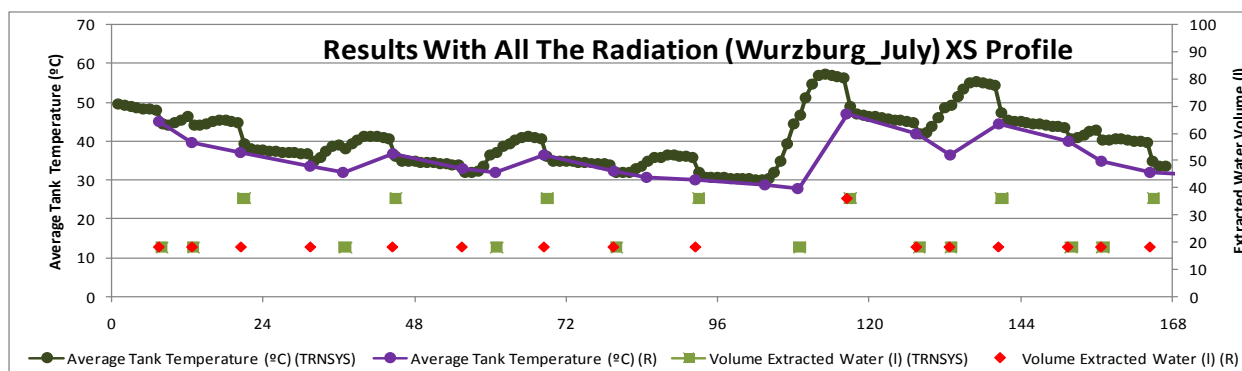


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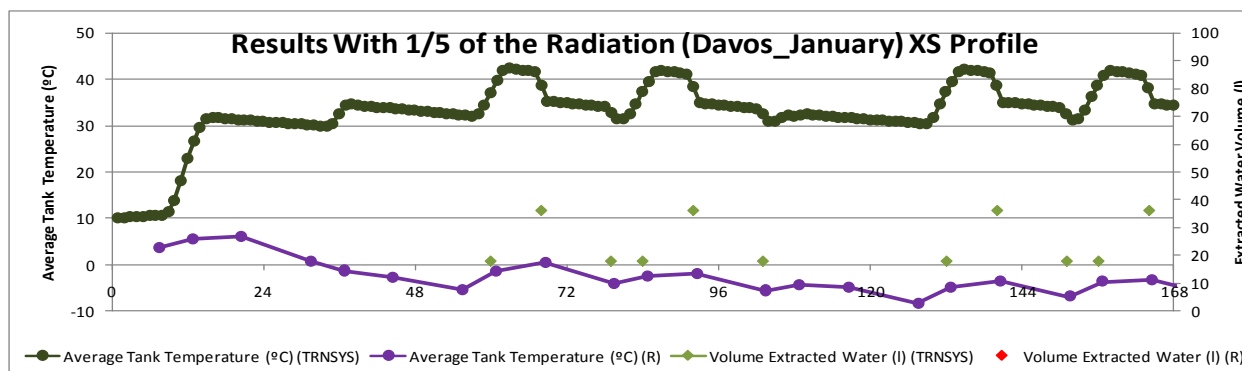
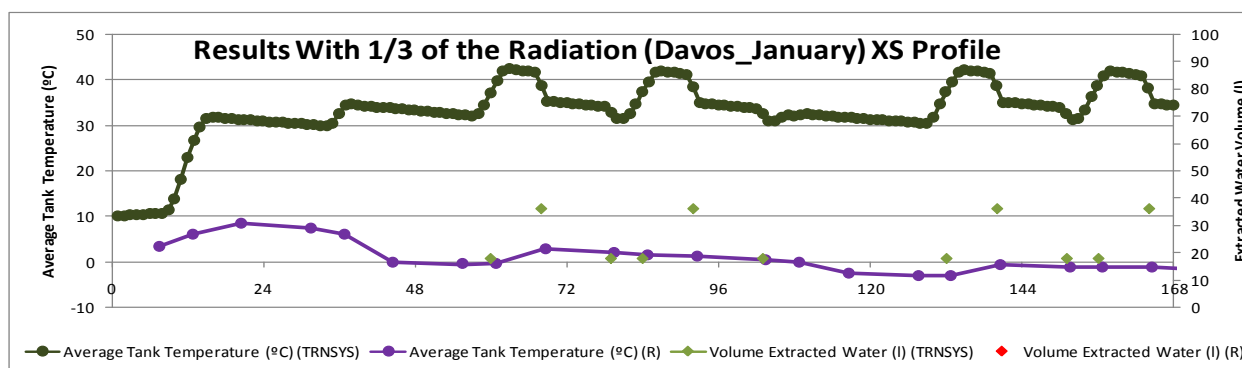
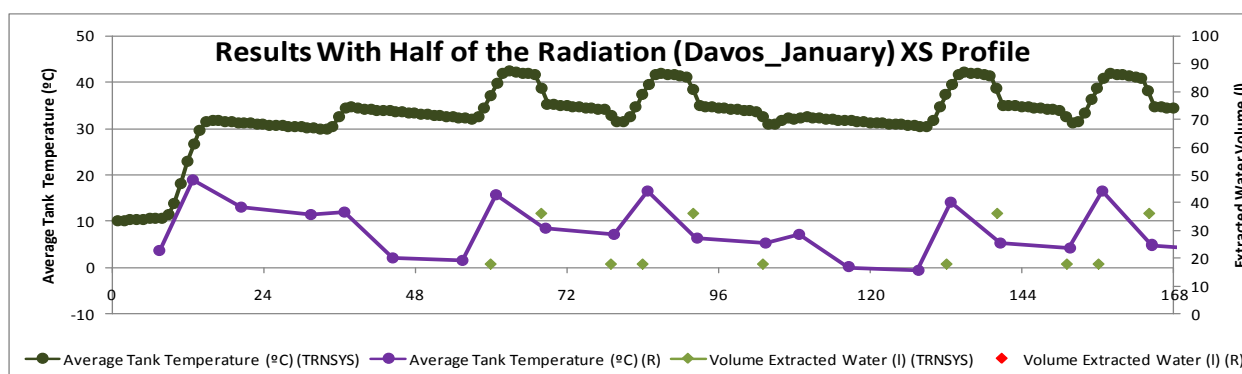
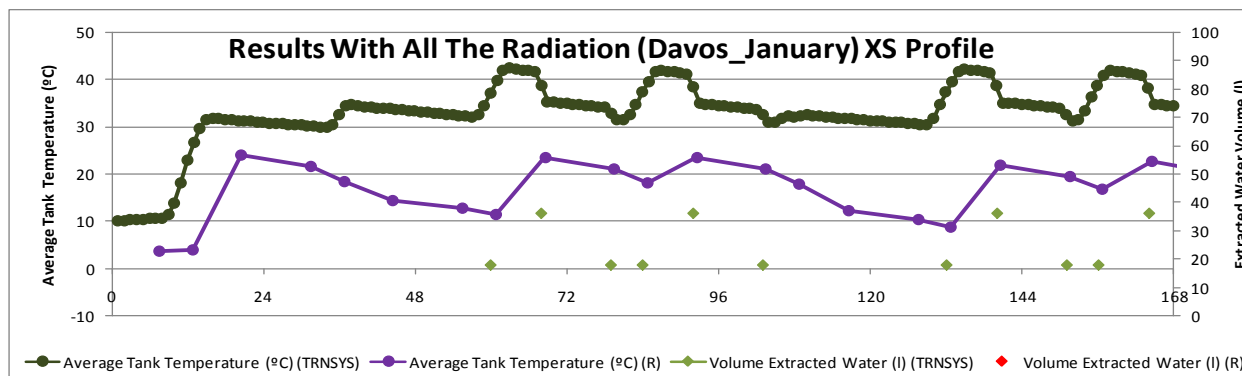


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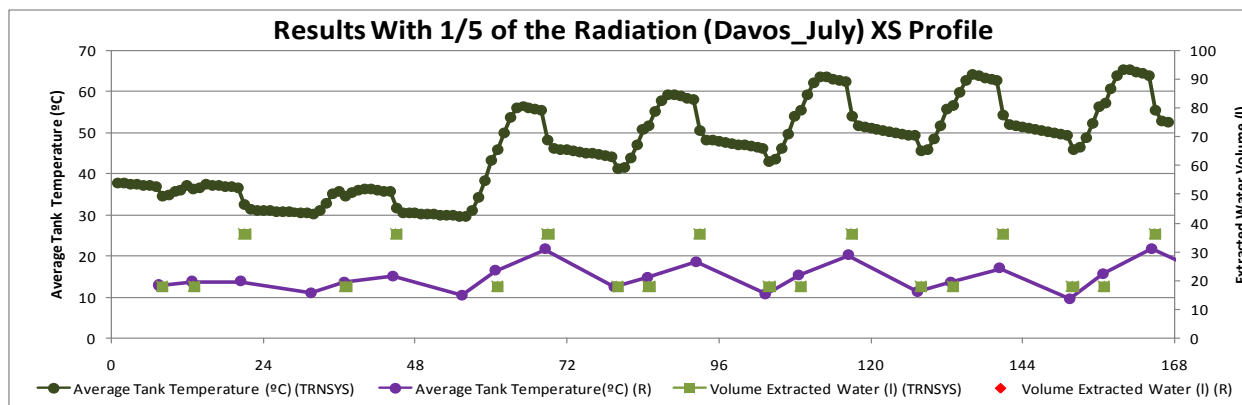
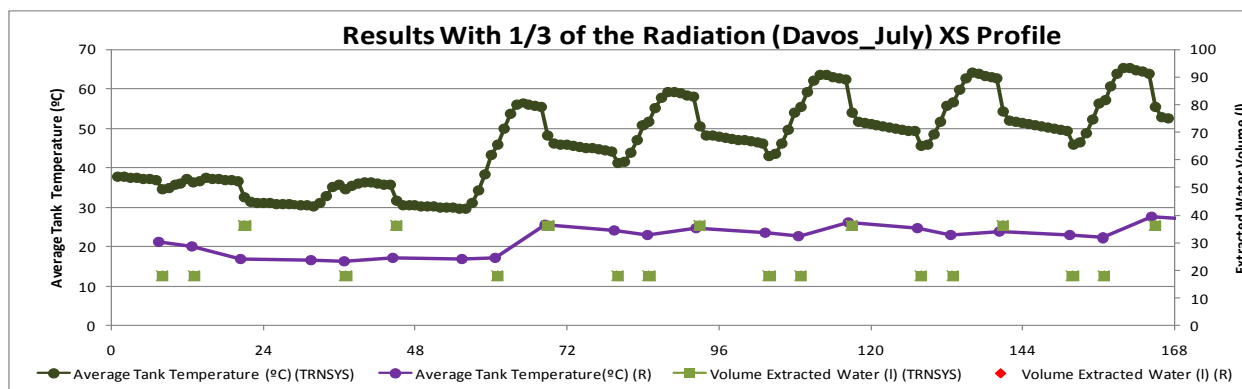
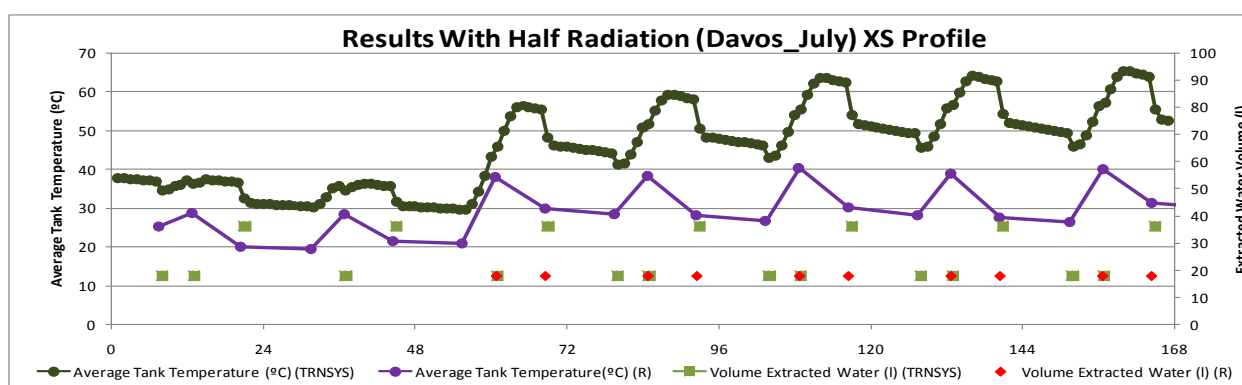
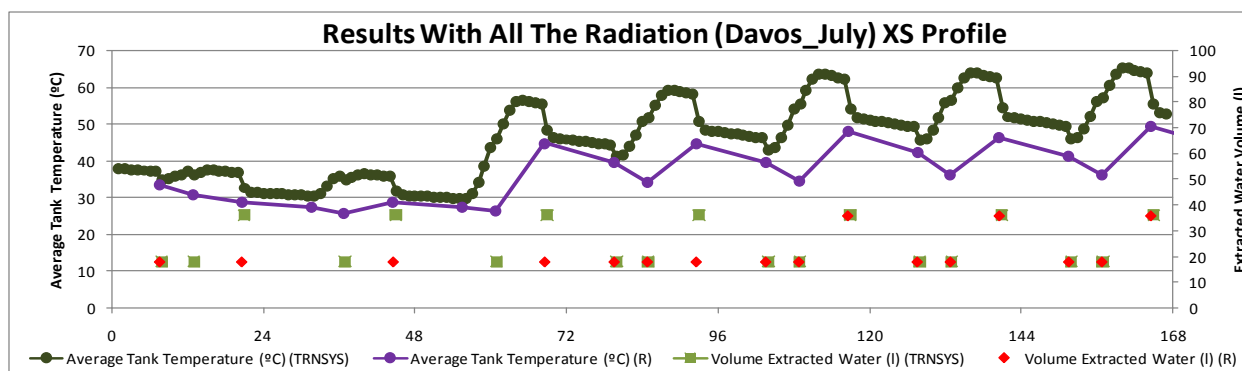


1.3 Davos results

1.3.1 January 1st week

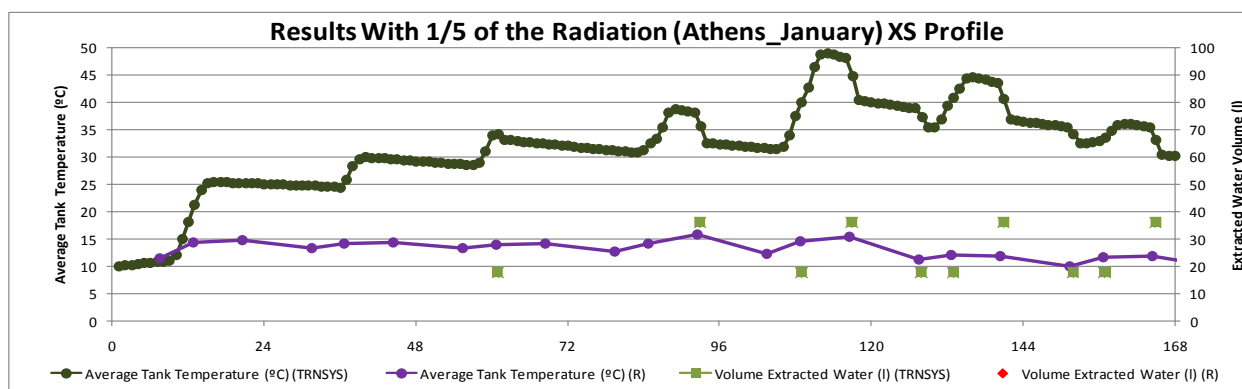
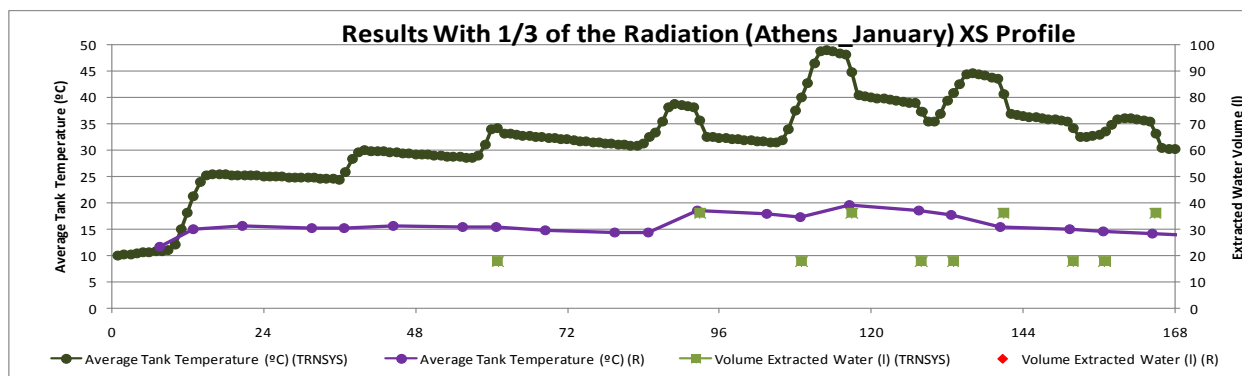
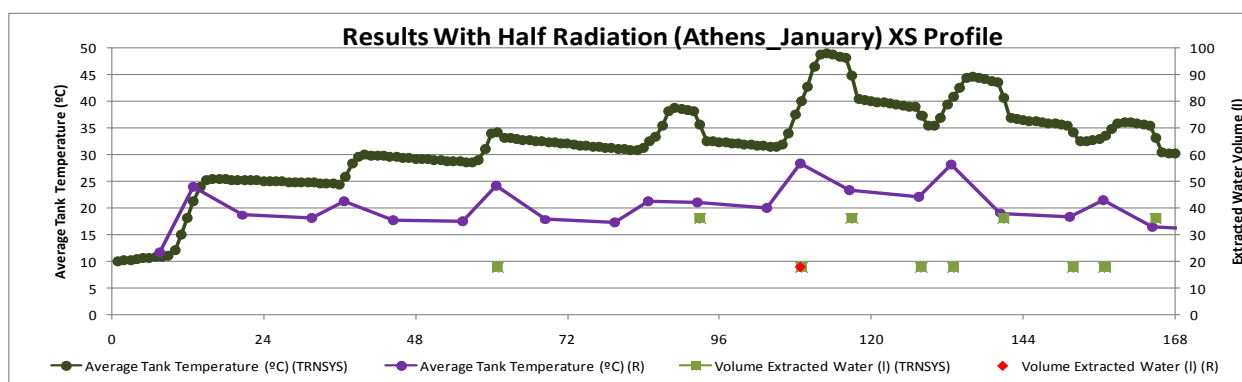
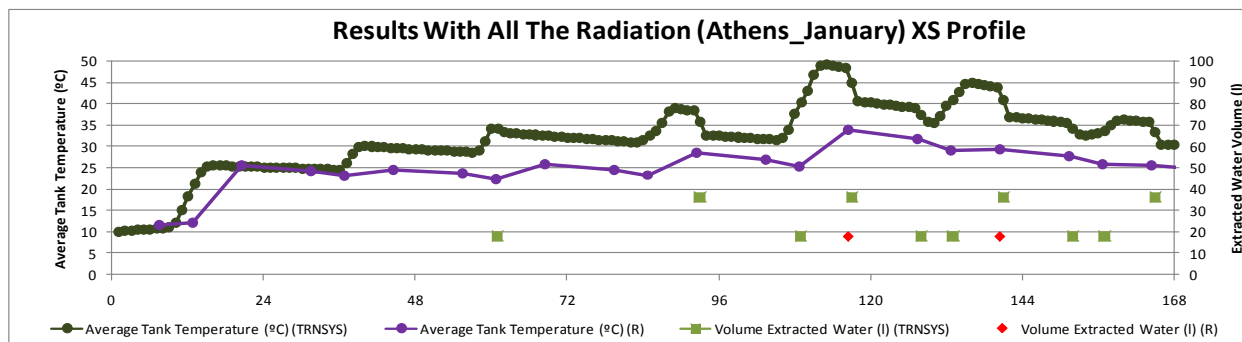


1.3.2 July 1st week

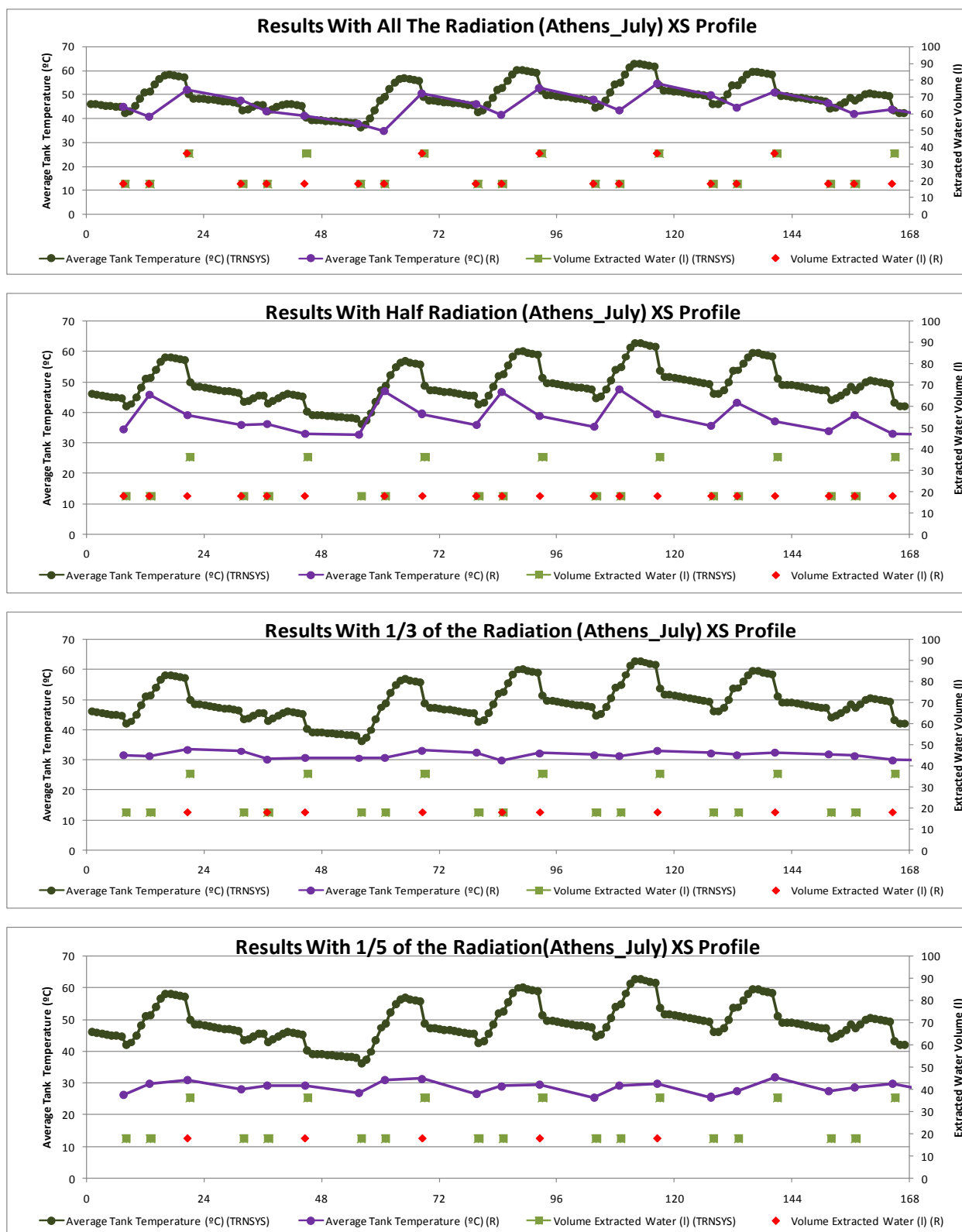


1.4 Athens results

1.4.1 January 1st week

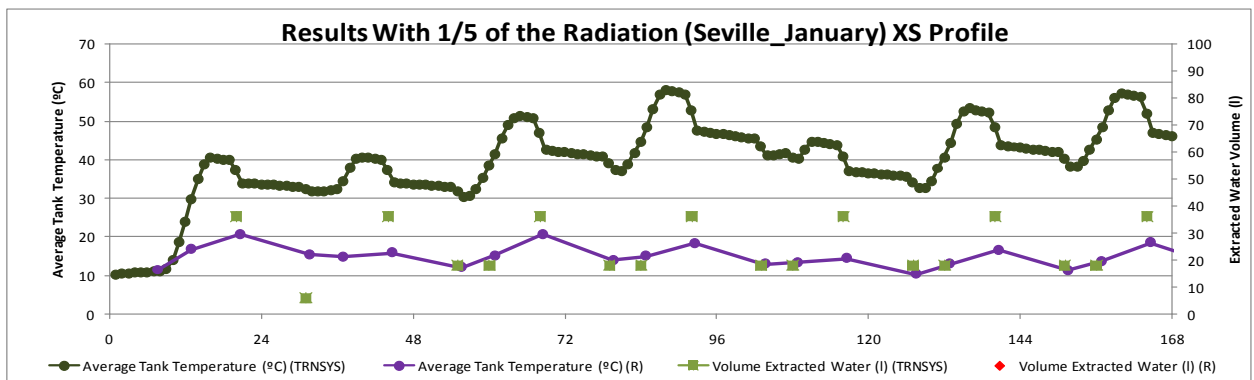
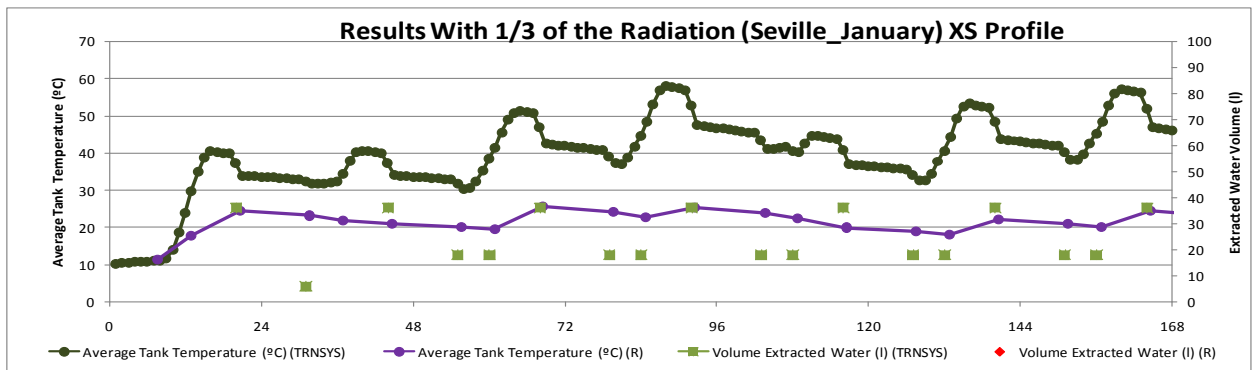
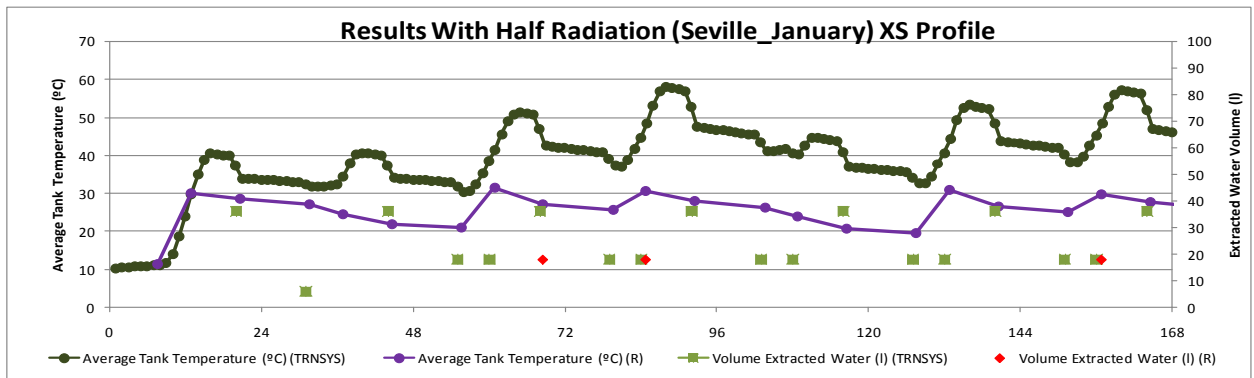
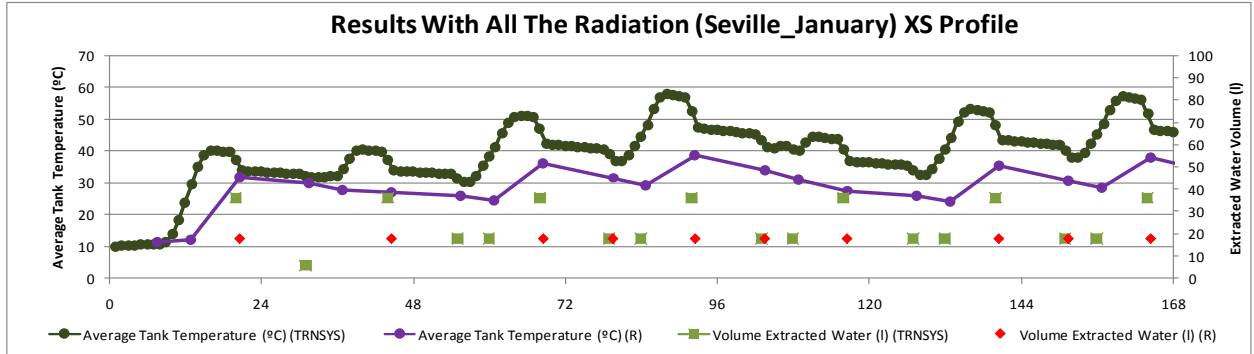


1.4.2 July 1st week

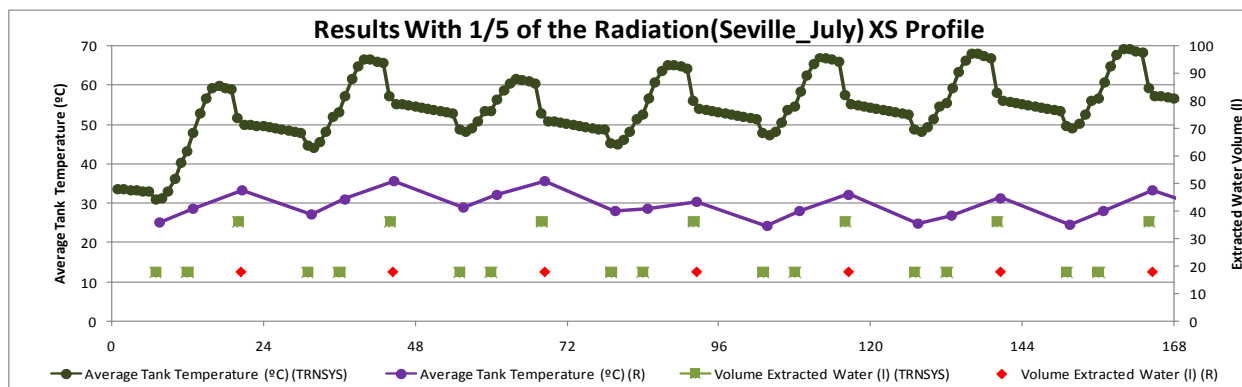
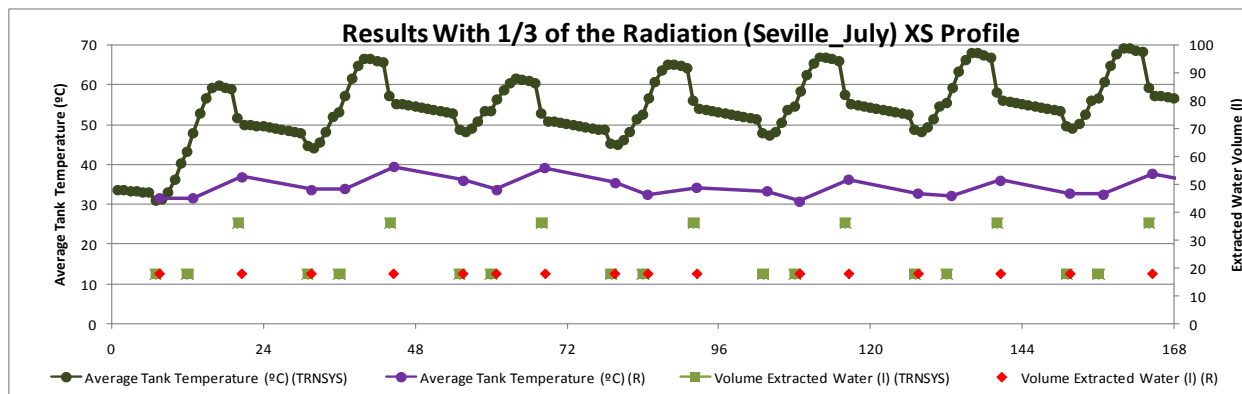
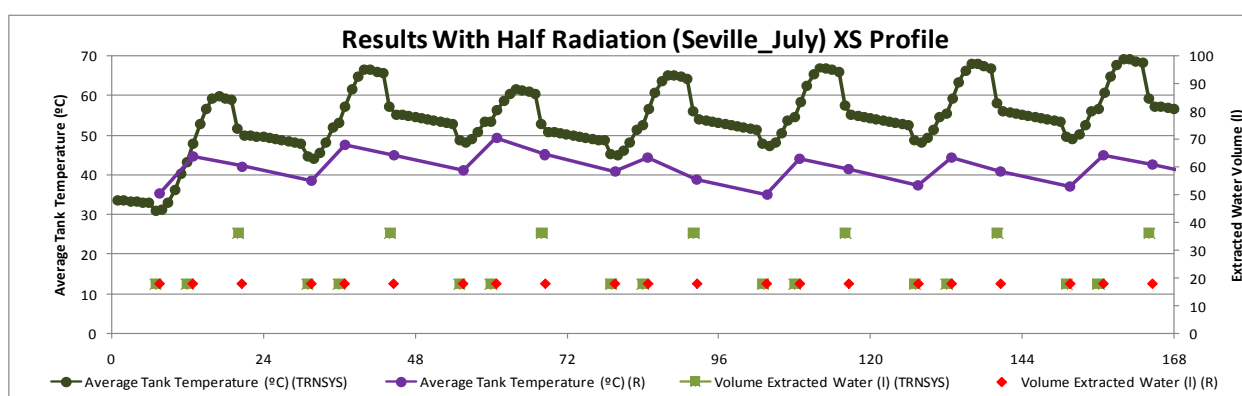
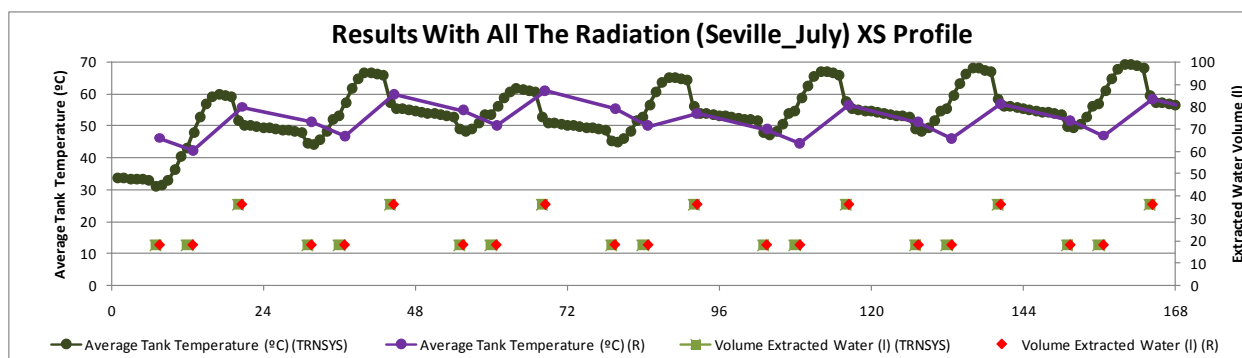


1.5 Seville results

1.5.1 January 1st week

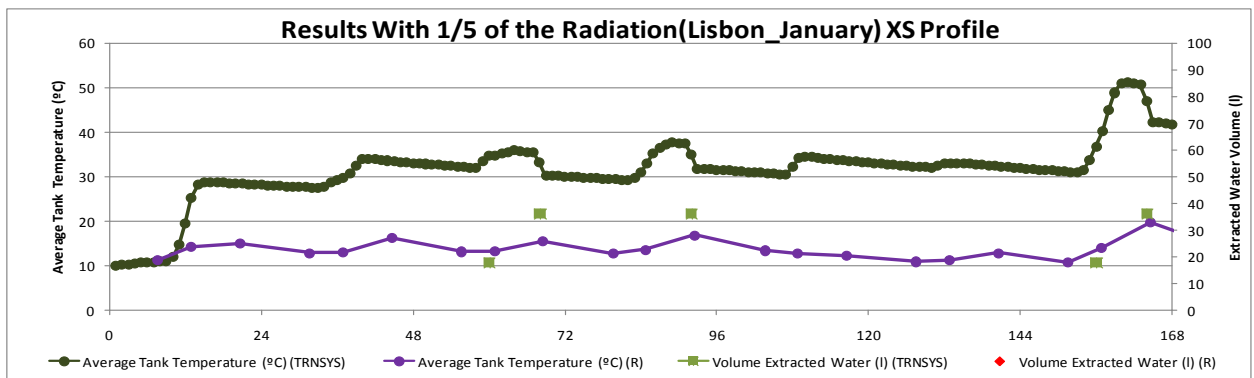
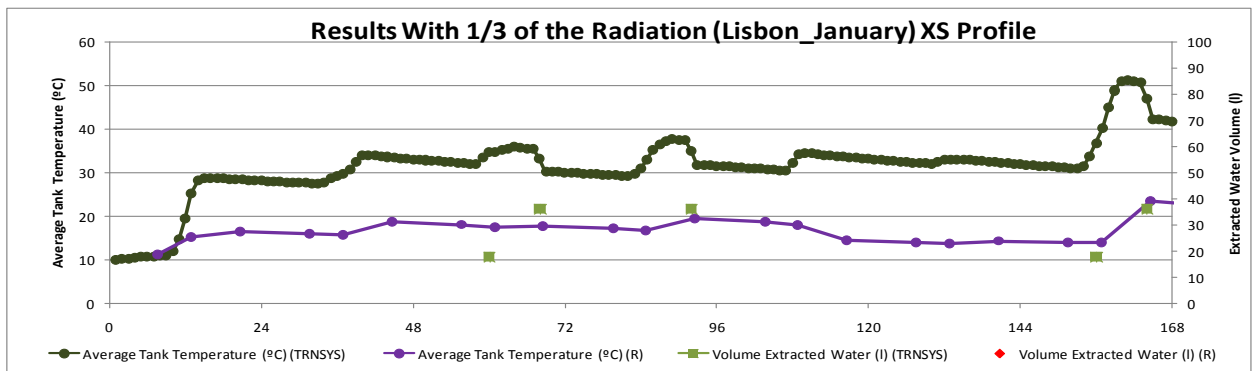
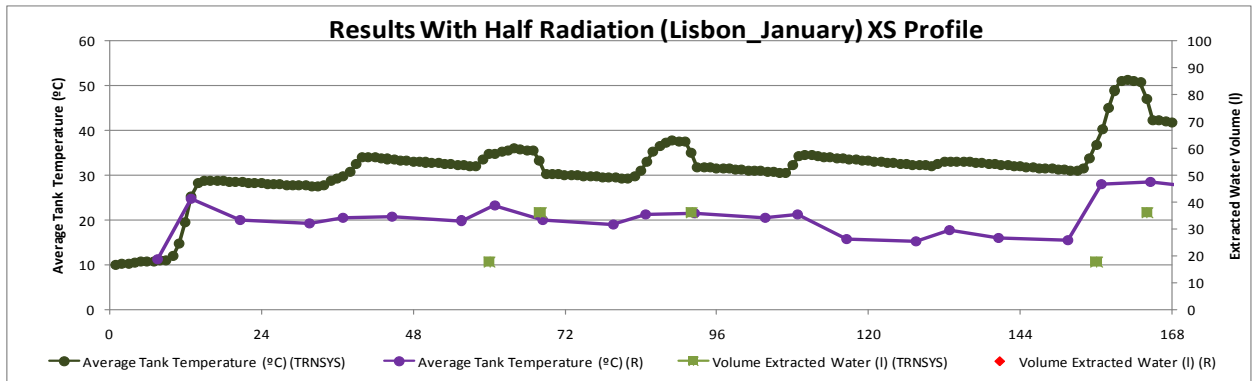
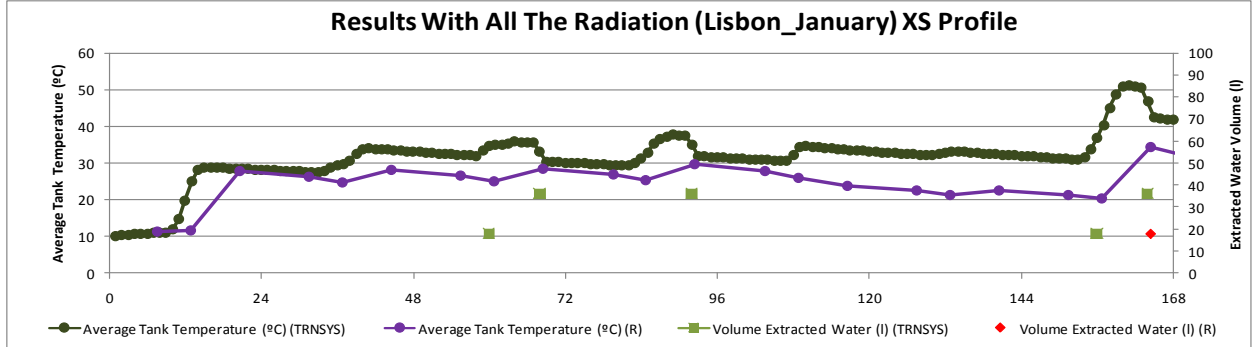


1.5.2 July 1st week

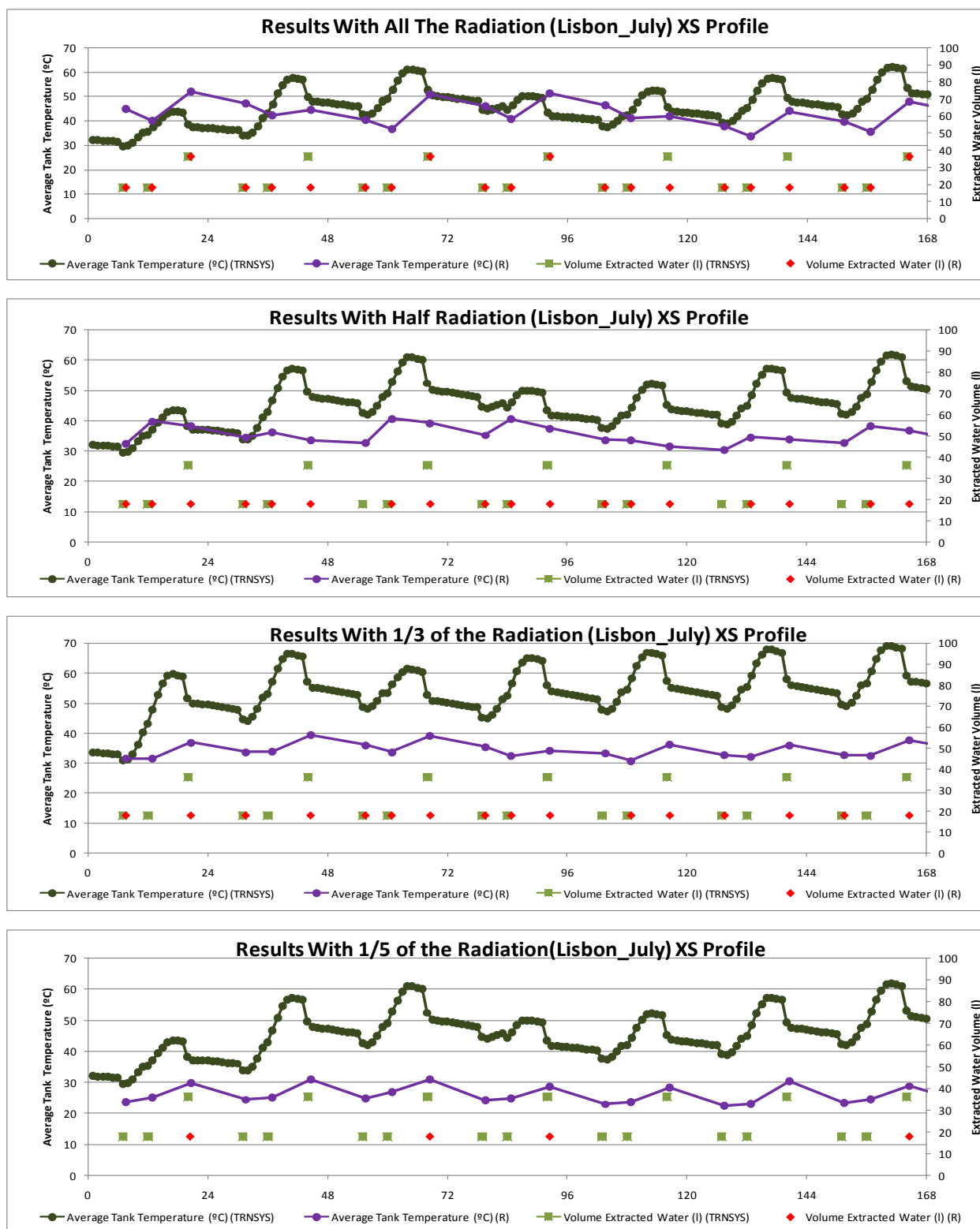


1.6 Lisbon results

1.6.1 January 1st week



1.6.2 July 1st week



2 ANNEX 2 - Solahart 180 J

2.1 Manufacturer technical data:

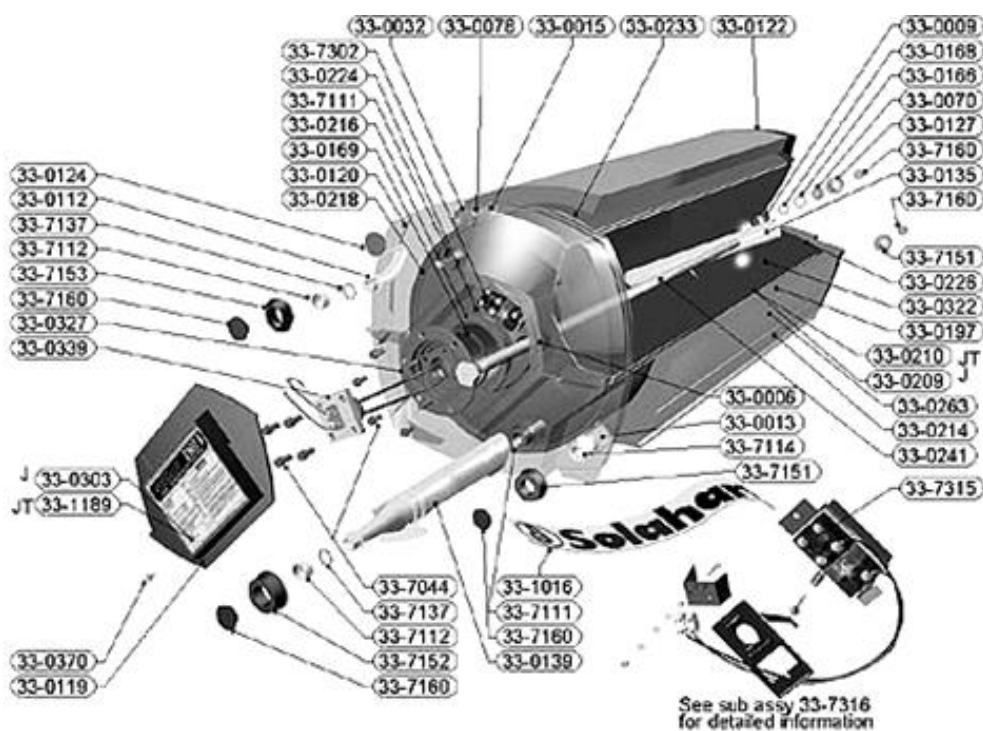
The following technical data from the Solahart manufacturer has been used in this study:

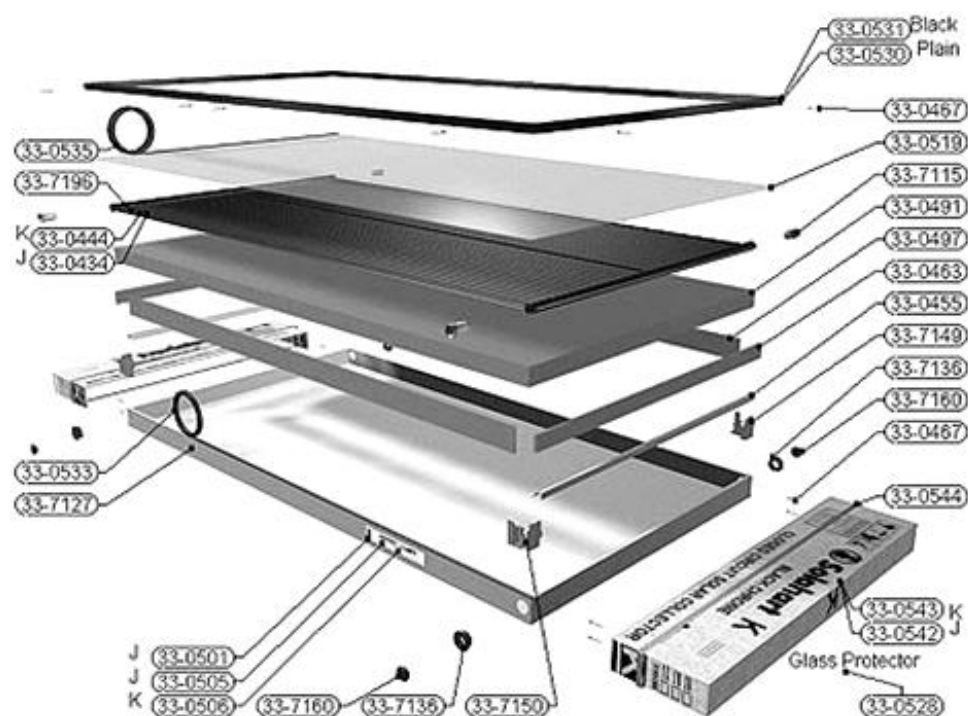
- Collector gross area: 1,95 m²
- Collector dimensions: 1937x1022x77 mm
- Storage tank volume: 180 l
- Storage tank position: horizontal
- Storage tank dimensions: 1062x510x510 mm
- Efficiency slope of the performance curve: 6,254 W/m²K
- The y-intercept of the collector efficiency curve: 0,835.
- Incident angle modifier constant: 0,19794
- Collector tilt: 45°.
- Inlet and outlet pipe loss coefficient: 8,3439 W/m²K
- Overall loss coefficient for the storage tank: 2,06 W/K
- Without auxiliary heater

J and J Free Heat Systems																
Model		150 tank	151 system	180 tank	181 system	182 system	220 tank	221 system	222 system	300 tank	301 system	302 system	303 system	440 tank	443 system	444 system
Tank model																
J		150J	✓	180J	✓	✓	220J	✓	✓	300J	✓	✓	✓	440J	✓	✓
J Free Heat		150F		180F	✓	✓	220F	✓	✓	300F		✓	✓	440F	✓	✓
Collector model			J		J	J		J	J		J	J	J		J	J
No of collectors			1		1	2		1	2		1	2	3		3	4
HartStat OTP	optional	-	✓	-	✓	✓	-	NA	✓	-	NA	✓	✓	-	✓	✓
Storage capacity	litres	150	150	180	180	180	220	220	220	300	300	300	300	440	440	440
	US gal	40	40	48	48	48	58	58	58	80	80	80	80	116	116	116
Delivery capacity (solar)	litres	130	130	160	160	160	200	200	200	260	260	260	260	400	400	400
	US gal	34	34	42	42	42	53	53	53	68	68	68	68	106	106	106
Boost capacity (electric or gas)	litres	75	75	90	90	90	110	110	110	150	150	150	150	220	220	220
	US gal	20	20	24	24	24	29	29	29	40	40	40	40	58	58	58
Weight empty	kg	56	102	66	108	154	78	124	170	99	145	187	229	148	290	320
	lbs	123	225	146	238	340	172	273	375	218	320	412	505	326	639	705
Weight full	kg	206	256	245	292	338	298	348	394	399	449	495	541	588	730	776
	lbs	454	564	540	644	745	657	767	869	880	990	1091	1193	1296	1609	1711
A – Width*	m	1.40	1.40	1.62	1.62	2.42	1.88	2.04	2.42	2.43	2.43	2.43	3.38	3.41	3.49	4.44
	in	55.1	55.1	63.8	63.8	95.3	74.0	80.3	95.3	95.7	95.7	95.7	133.1	134.3	137.4	174.8
B – Length*	m	0.51	2.63	0.51	2.63	2.63	0.51	1.64	2.63	0.51	1.64	2.63	2.63	0.51	2.63	2.63
	in	20.1	103.5	20.1	103.5	103.5	20.1	64.6	103.5	20.1	64.6	103.5	103.5	20.1	103.5	103.5

* An additional 0.9m (35.4in) should be left on all four sides of the installation for safe access and servicing.
 The J and J Free Heat systems (if installed with a HartStat OTP system) can be installed as a solar preheater with an in-line Solahart gas booster water heater.
 Refer to the Solahart gas booster specification sheet for further details on the gas booster.

NA - Not available.





2.2 CSTG test results

System before insulation



The CSTG test results for the Solahart 180J Thermosiphon system are:

- CSTG performance test parameters: $a_1=0,9766712$, $a_2=0,3745053$ and $a_3=-0,1650541$
- The storage tank heat loss coefficient is: $U_s=3,6557 \text{ W/K}$

- Cold water temperature of is: $t_{\text{main}}=10\pm 2\text{ }^{\circ}\text{C}$
- The values of the normalized draw-off temperature profile $f(V)$ values each tenth of the storage tank volume (V_s) and interpolated among them every V_s centh. The $f(V)$ values are given for the daily irradiance ranges: from 8 MJ/m^2 to 16 MJ/m^2 and from 16 MJ/m^2 to 25 MJ/m^2 :

f(V) for 1/10_ Vs	
H \geq 16 MJ	H < 16 MJ
0,10347623	0,11130203
0,10258455	0,11072659
0,10128982	0,10544729
0,09905603	0,1018398
0,09708699	0,09720469
0,09490326	0,09184529
0,09229965	0,08407911
0,08484231	0,06945758
0,06551195	0,0494434
0,04048087	0,03219412
0,0234717	0,02275453
0,01592402	0,01759445
0,0117969	0,01404462
0,00936776	0,01166695
0,00771179	0,0101662
0,00653109	0,00877318
0,00589734	0,00797335
0,00500447	0,00702607
0,00458831	0,00624612
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0,00324347	0,00456744
0,00291264	0,00416484
0,00264959	0,00376626

0,00240467	0,00341951
0,00220965	0,00315794
0,0020266	0,00293051
0,00186313	0,00271013
0,00173613	0,00249516
0,00160022	0,00231197

The previous table shows the $f(V)$ values at volume intervals of every tenth of the tank volume (V_s).

- The values of the normalized mixing draw-off profile expressed as a function of the storage tank extracted volume, The $g(V)$ values are known each V_s tenth:

$g(V)$ for $1/10 \cdot V_s$
0,10335833
0,10333885
0,10332555
0,10329649
0,10324224
0,1030651
0,10195262
0,09390334
0,06953657
0,03886318
0,02000076
0,01153071
0,00780698
0,00581182
0,00469785
0,00390752
0,00340576
0,00286559

0,00244326
0,00224675
0,00185757
0,00171956
0,00143215
0,00126035
0,0011218
0,00101434
0,00085241
0,00080792
0,00070726
0,00062641

In this case shows the $g(V)$ values at volume intervals of every tenth of the tank volume (V_s).

In a graphic format the $f(V)$ and $g(V)$ profiles for every tenth of the tank volume for the TS SolaHart 180J are the following ones:

