

TOWARDS THE STANDARDIZATION OF MOLTEN SALT LOOPS' INSTRUMENTATION AND COMPONENTS

Integration of components in a 3.5MW molten salt plant

Dr. Pedro Horta

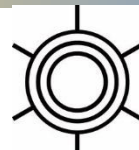
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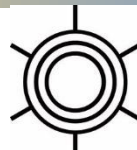


Structure

1. Motivation - Objective
2. Experimental setup
3. Experimental procedure
4. Challenges and Lessons learned



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Motivation - Objectives



- ◆ Development of the RI and collaboration with others via access and Joint research Activities;
- ◆ Evaluate and test existing equipment at EMSP;
- ◆ Evaluate alternative preheating method and equipment.

Experimental Setup

HPS2 MS loop main components: full molten salt (Solar field and thermal storage) demonstration of CSP plant

Solar Loop

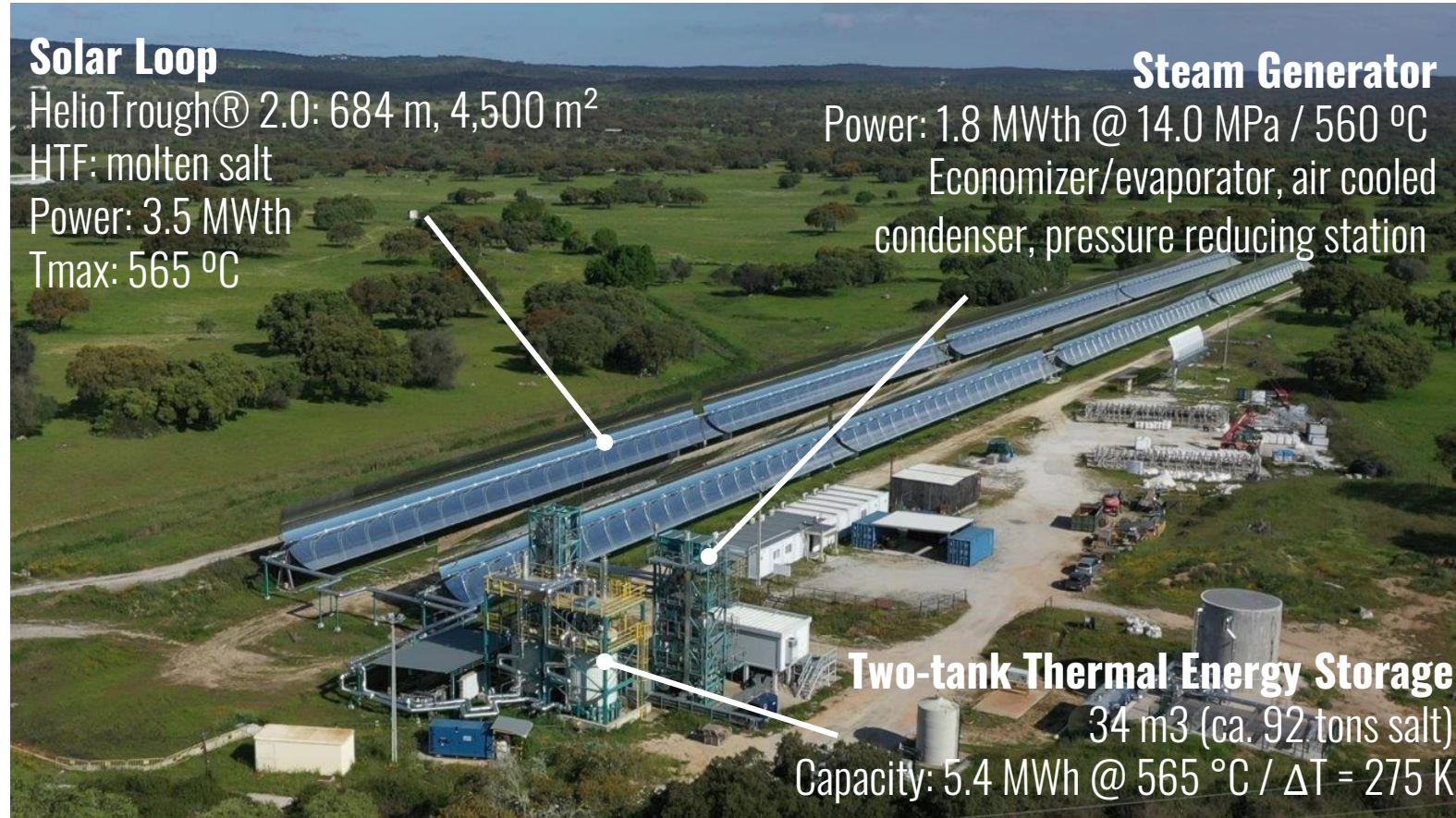
HelioTrough® 2.0: 684 m, 4,500 m²
HTF: molten salt
Power: 3.5 MWth
T_{max}: 565 °C

Steam Generator

Power: 1.8 MWth @ 14.0 MPa / 560 °C
Economizer/evaporator, air cooled condenser, pressure reducing station

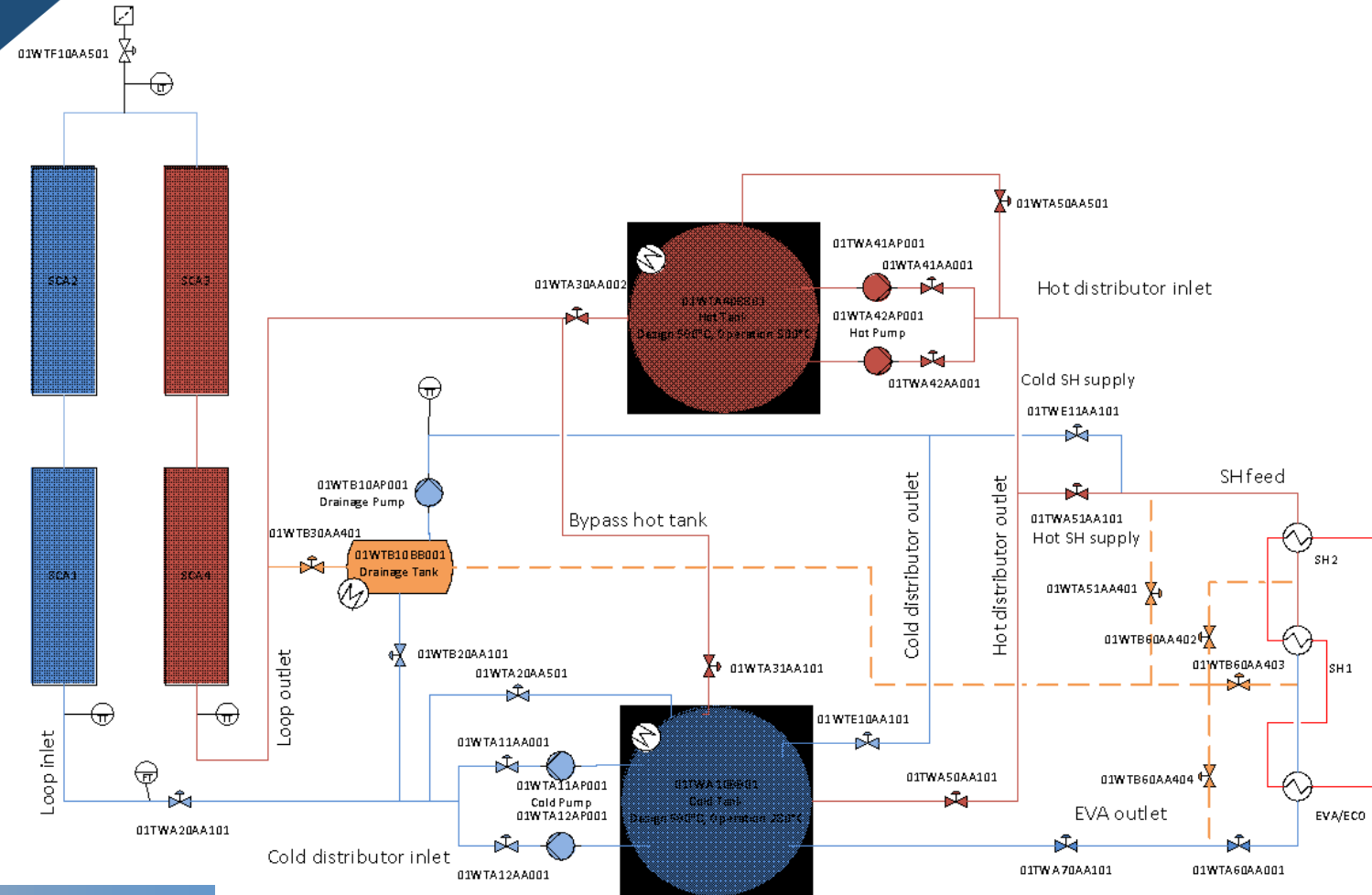
Two-tank Thermal Energy Storage

34 m³ (ca. 92 tons salt)
Capacity: 5.4 MWh @ 565 °C / $\Delta T = 275$ K

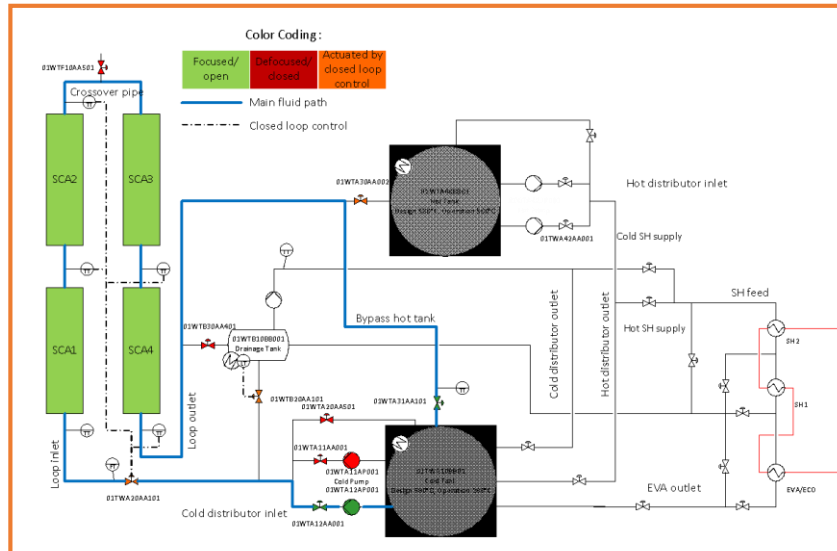


Experimental procedure

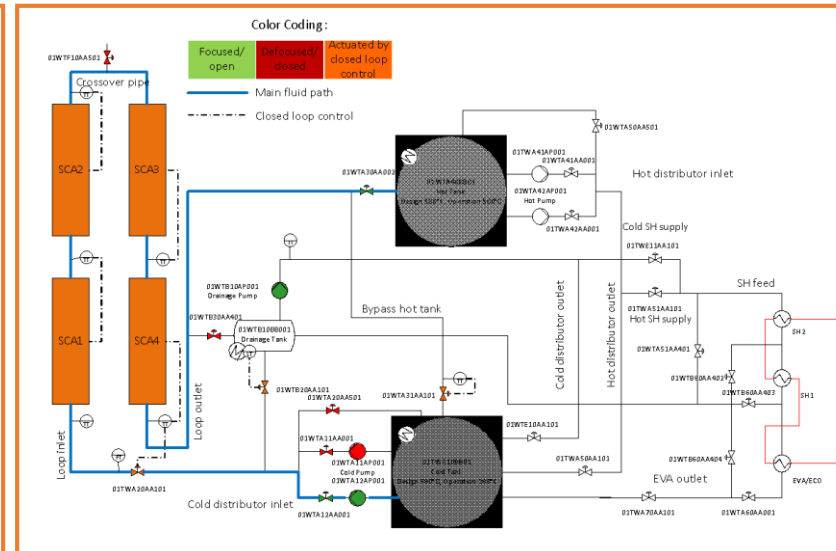
- Heat Transfer fluids: **Yara Most Molten Salt & solar salts**
- Piping: **3" and 2" inches**
- Control system:
 - **T3000 DCS**: controls the salt cycle and the water steam cycle.
 - **FSC** "Field supervisory control": controls the movement of the SCAs.
 - **Tracevision** Impedance heating of the solar field control system to control and heat all components of the plant to operating temperature before filling it with molten salt.



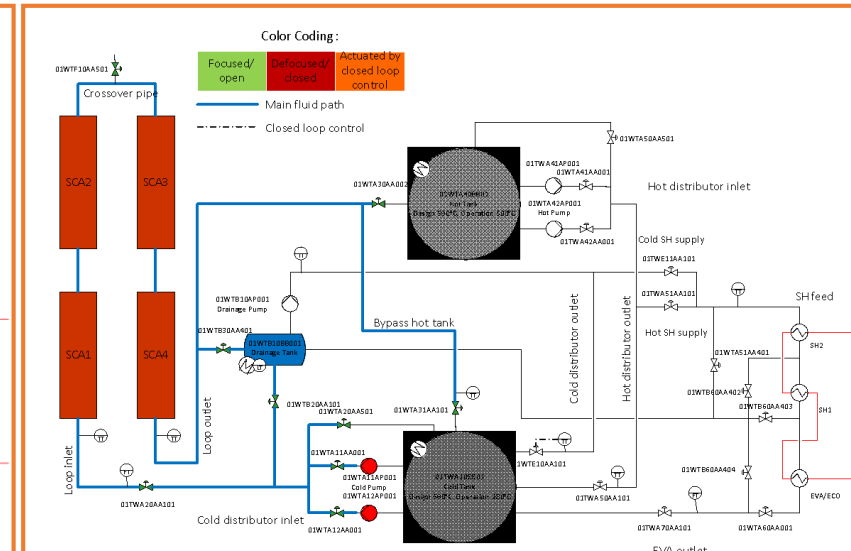
Experimental procedure



System in Solar field start-up mode



Solar Field normal operation mode



Solar field drainage mode

Challenges and Lessons learned

Damage phenomena and problems	Reason	Solutions and Improvements
Plugs after valves (COP) □ Drainage or venting not possible	Valves internal Leakages	Improvement of trace heating after valves for drain the leaked salt
Welding of used Receiver difficult	Salt remaining in the pipe melt during welding and lead to leakages	Adapt welding procedure, position of SCA during welding
Plugs in salt piping	Defective trace heating, Cold spots due to different insulation	Check trace heating before insulation (IR-camera, visual, temperatures)
Leakage REPA	Movement of SCA with solid salt in the REPA.	Not just REPA need to be preheated to move SCA, also HCE need to be hot

Challenges and Lessons learned

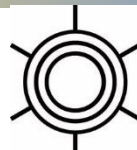
Damage phenomena and problems	Reason	Solutions and Improvements
Salt pumps – overheating of bearing (outside of tank!) between packing and roof of tank (limit approx. 115/120 °C)	Grease evaporates	Active Ventilation
Salt pumps – leakage	In packages; maybe tank to full	Improvement of trace heating after valves for drain the leaked salt
Salt pumps – MI-cable loss of functionality	Moisture entering insulation material -> lowering of electrical resistance -> damage	Heating
Short circuit on EHT valve coils	EHT coil of the salt cycle valves (FLOWSERVE)failure. Short-circuit due to overheating->bad design	Design of pieced to allow distance between the spires of the coil

Thank you for your attention

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