SFERA-III

Solar Facilities for the European Research Area

Condition monitoring in solar process heat applications

Hannes Laget - Azteq

NETWORKING

Summer School: "Smart CSP: How Smart Tools, Devices, and Software can help improve the Design and Operation of Concentrating Solar Power Technologies" - WP1 Capacity building and training activities - Cologne, Germany, September 14th-15th 2023

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO **823802**

AZTEQ

solarlite
plugged to the sun

AZTEQ goals

Our Vision

A greener, sustainable & energy autonomous Europe.

Our Mission

With AZTEQ we aspire to a European revolution in green heat technologies on an industrial scale. The AZTEQ solar thermal systems will help convert European factories to use 100% green heat.

Our Goals

By providing affordable solar energy, AZTEQ supports the following UN Sustainable Development Goals

- Direct impact

- Consequential impact

Solar Process Heat Applications

- The plants typically consist of:

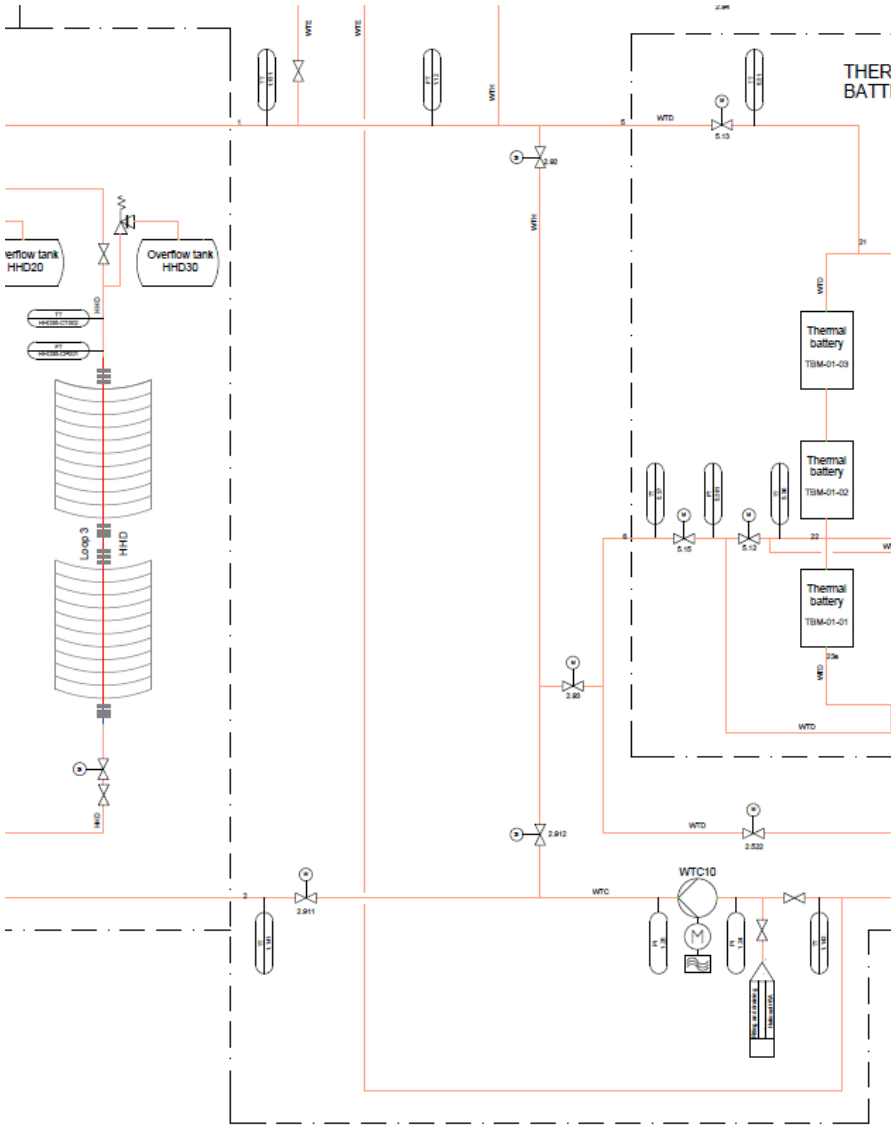
  - a solar field (primary loop)
  - a balance of plant (pump + heat exchanger)
  - a client connection (secondary loop)

- Plants are custom made:

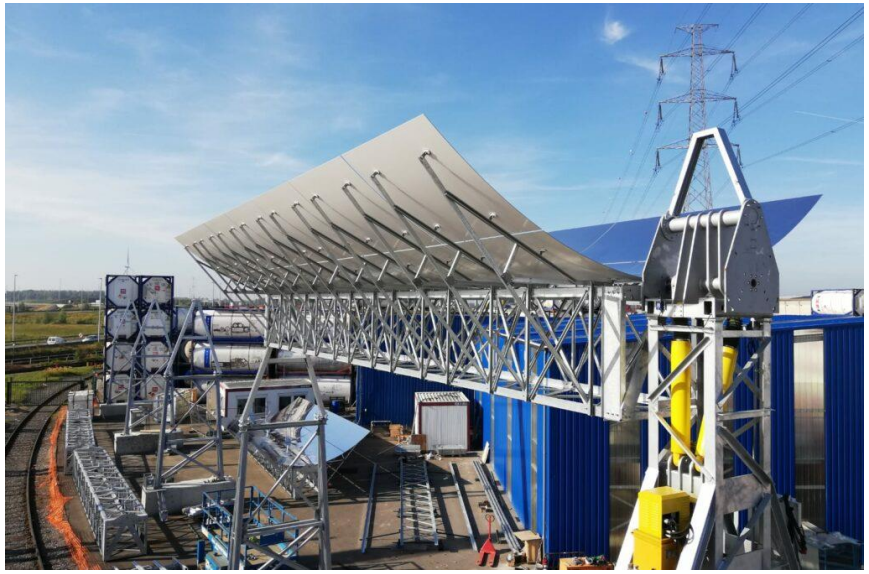
  - loop lengths function of available land and form factor
  - delivery temperature of heat and fluid in secondary loop depend on tie-in into industrial process
  - storage might be integrated to increase solar fraction

- Unmanned operation is a must:

  - very high cost of personal for small plants
  - limited interventions required



AZTEQ Plants



adpo

- 1,100 m² aperture area; 500 KWth capacity
- Up to 300 °C in primary oil circuit
- Steam generation at 5 bar, 152 °C
- 100 tons CO_2/y savings

proviron

- 1,100 m² aperture area; 500 KWth capacity
- Up to 330 °C in primary oil circuit
- Steam generation at 11 bar, 185 °C
- 105 tons CO_2/y savings

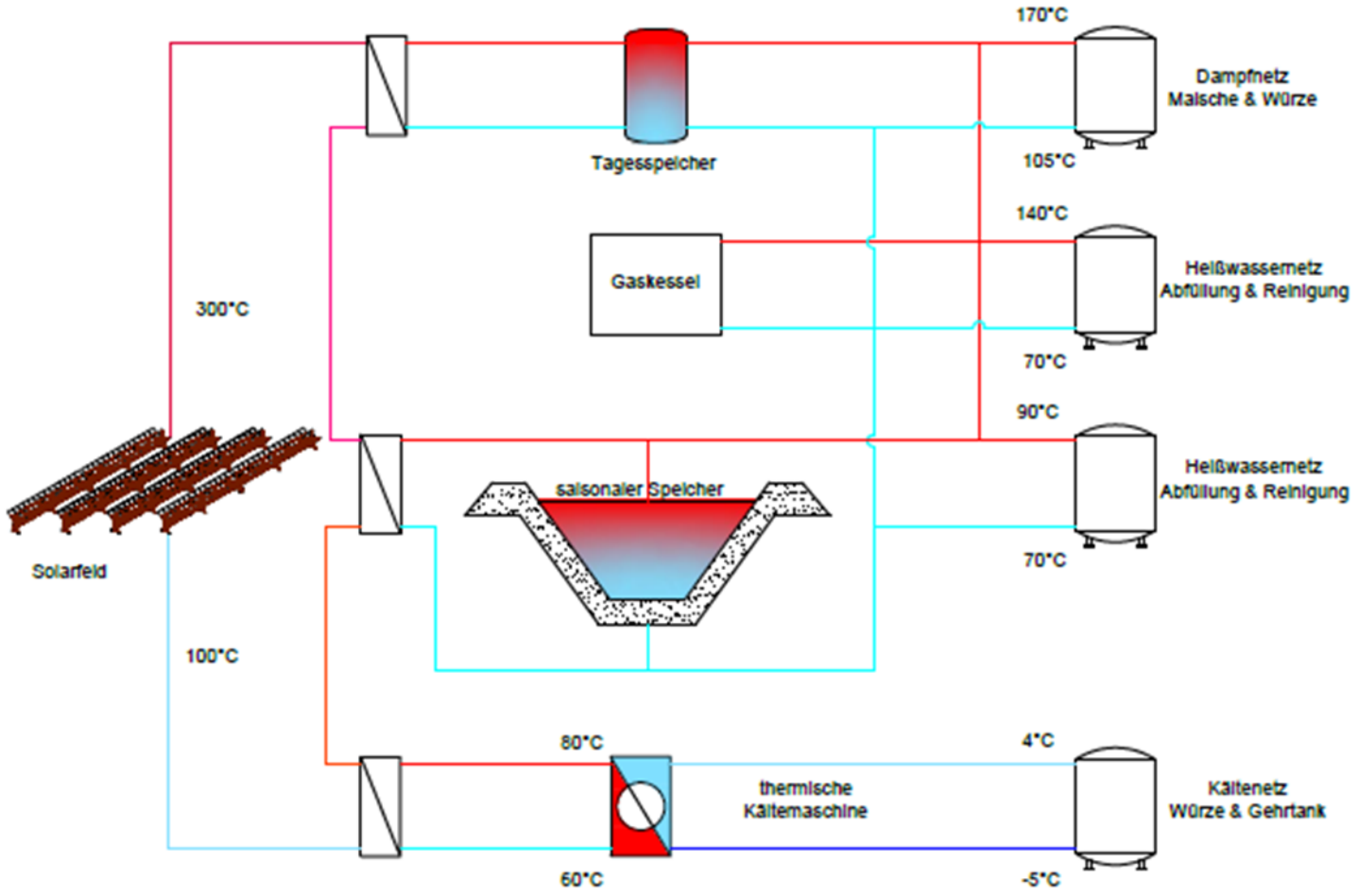
AZTEQ Plants

- 5 800 m² aperture area; 2,5 MWth capacity
- Up to 390 °C in primary oil circuit
- Hot thermal oil at 6 bar, 280 °C
- 400 tons CO_2/y savings

- 44 000 m² aperture area; 30 MWth capacity
- 210 °C in primary hot water circuit
- Hot water generation at 5 bar, 155 °C
- 6100 tons CO_2/y savings

Technological Overview - Future

Full integration of different storage technologies

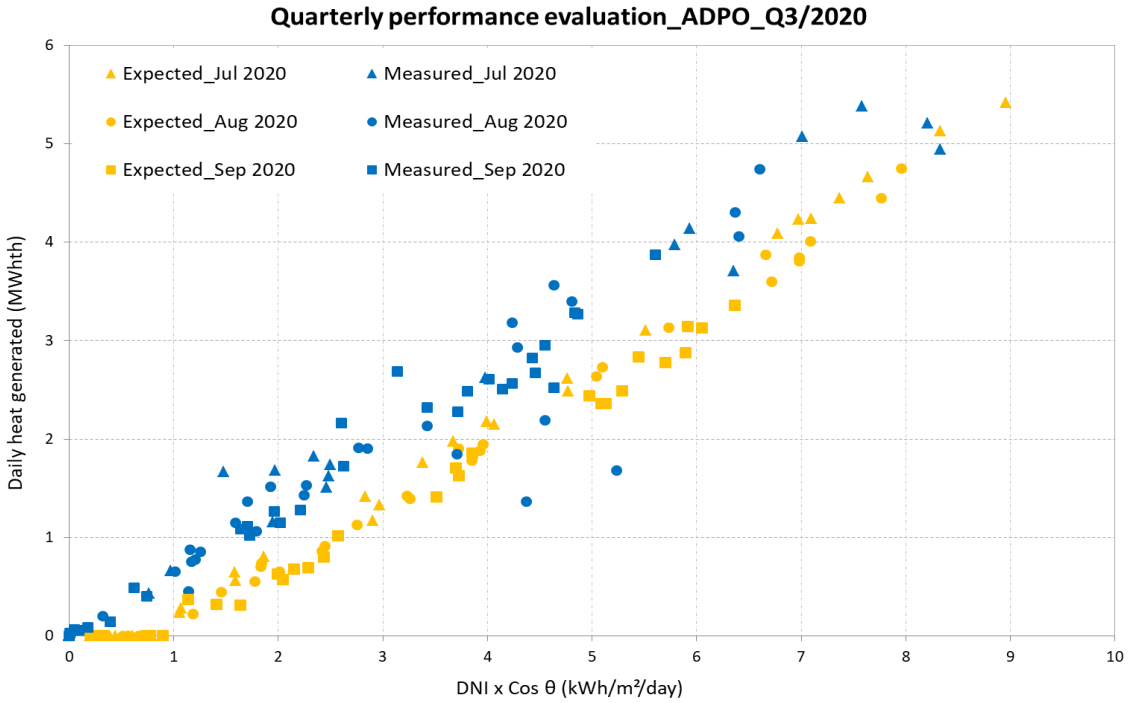


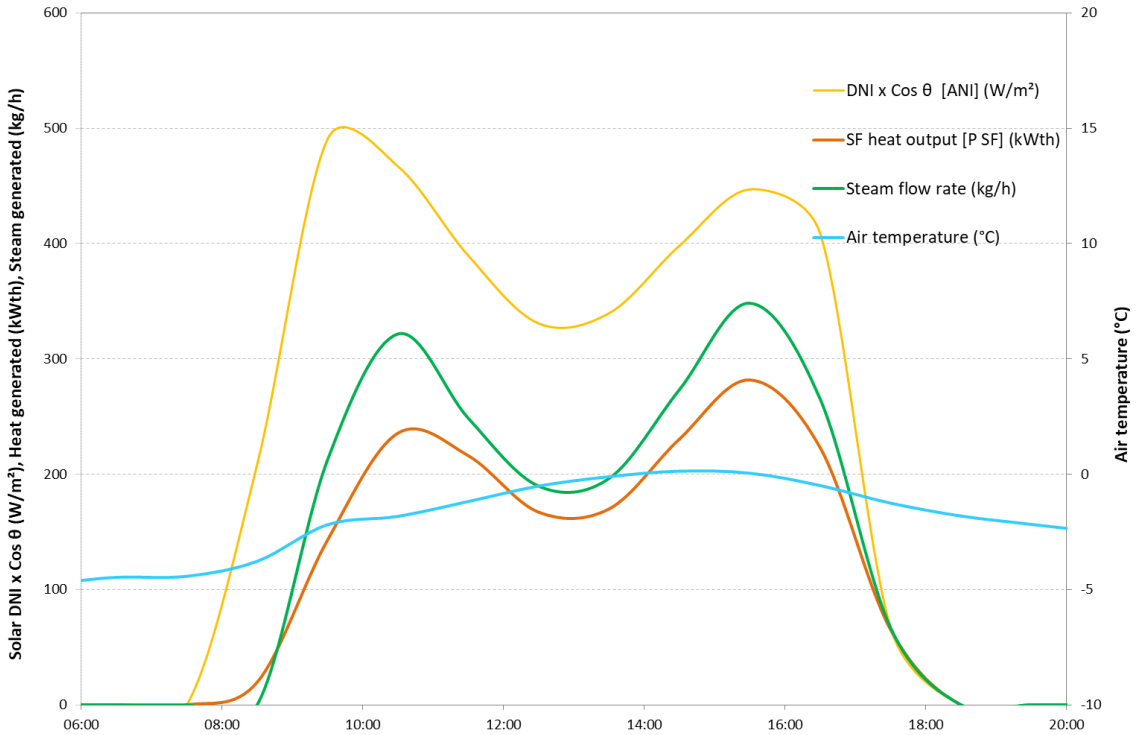
- The solar boiler in the field generates the heat you need.
- This heat can be stored, so you can get the solar heat when you need it, 24/7.
- The heat can be used for any application. From process heat to cooling, desalination, power production, etc.
- **Monitoring of state of charge of all technologies becomes primordial** to get the best out of the plant.

➔ **Power and energy control**

Azteq Plants - Experience

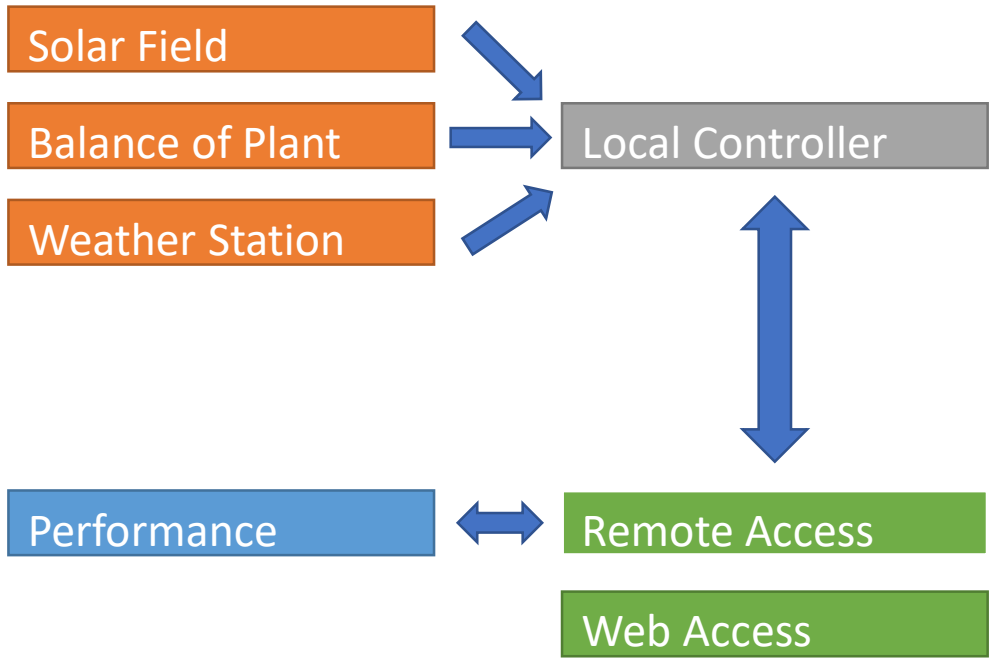
- Successful demonstration in low DNI locations – 950-1100 kWh/m²/y
- Performance in line with or higher than expectation.
- Stable operation even on winter days with low DNI
- Reliable interaction with existing heat generator
- Remote monitoring supports the unmanned operation and maintenance of the plant





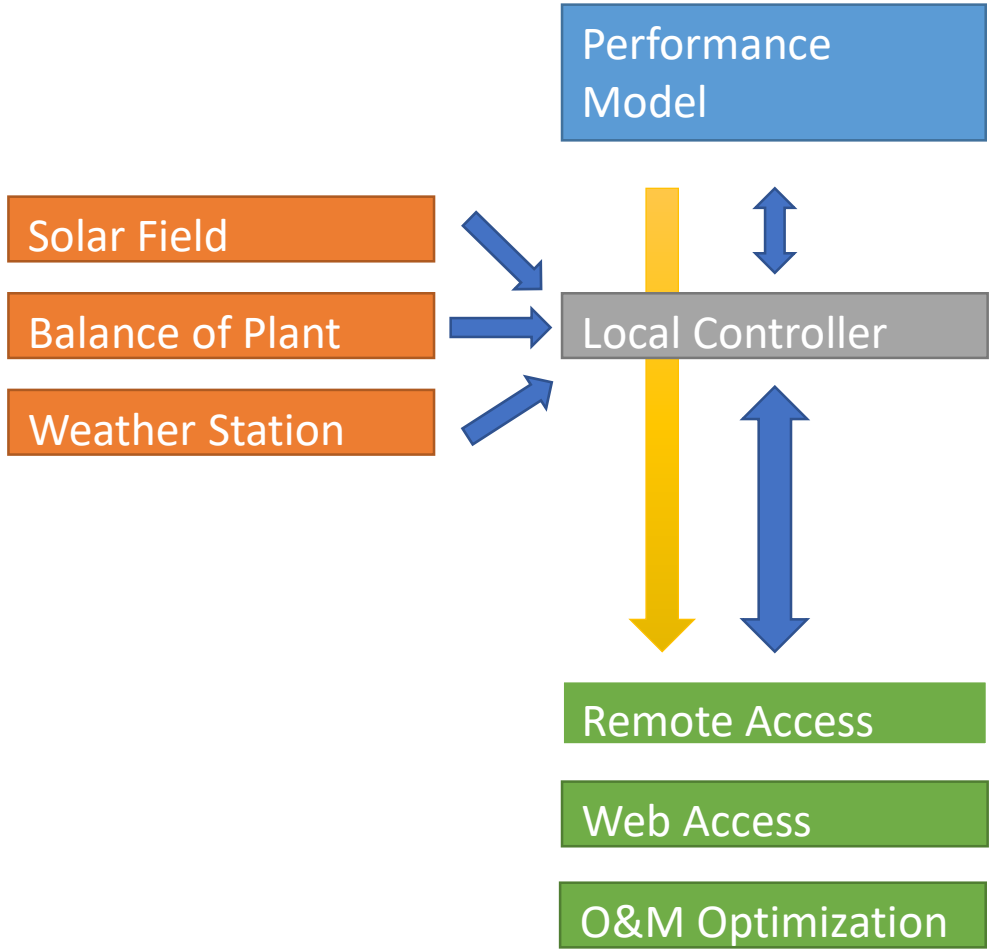
Monitoring – Current set-up

- Local controller supervises the operation of the plant instantaneously and controls the main parameters within boundaries. Automatic start-up based on irradiation measurement.
- Control system accessible from a distance for supervision. Automatic alerting in case of major issue to operation and maintenance team.
- Main process and production data are gathered via webpage, accessible to client.
- Off-line performance assessment and comparison of operational data with theoretical production model. Today manual and time consuming.



Monitoring – Future

- Local controller supervises the operation of the plant. Incorporated digital twin will compare current performance with estimated values.
- Control system will automatically perform different tasks, such as performance optimization and early fault detection. Certain maintenance operations will be suggested by the system.
- Central operations and maintenance team will receive the information of different plants, which feeds the interventions that are needed on-site.
- The control system will also involve energy dispatch, as storage will become a part of the solution.
- Common and uniform platform for all plants for higher maintainability.



Conclusions

- Solar heat in the industry has a bright future, but
  - High levels of automatization and remote monitoring and control are a must.
  - Carefree operation of the installation is required by the final client (comparable to industrial gas boilers)

- Evolution towards full model-based operation and maintenance
  - Error resilience – continued operation, despite sensor failure
  - Performance optimisation
  - Early fault detection
  - Maintenance optimisation

- Integration of storage adds another layer of complexity through energy management
  - Current plants operate in power control mode
  - With storage, power and energy control will be required
  - Further option to deal with variable weather conditions

Contact

Thomas Ven
Sales Manager Germany
+32 468 59 09 94
thomas.ven@azteq.be

Dr. Hannes Laget
R&D director
+32 477 69 03 63
hannes.laget@azteq.be