hycool©
Solar Cooling Systems

# Industrial Cooling through Hybrid system based on solar heat

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# Consortium

Veolia Serveis Catalunya
IDP Ingeniería y Arquitectura Iberia S.L.U.
Bo de Debò
Consiglio Nazionale delle Ricerche
Comet Technology
Fahrenheit AG
R2M Solution SRL
Empa
CiaoTech S.r.l
Ecotherm (takeover of Frexnex)
Austrian Institute of Technology
Givaudan
Ekodenge
Dr. Jakob energy research GmbH & Co. KG
Asociación Española de Normalización

# Key objectives

**HyCool Project Mission** is increasing the current use of Solar Heat in Industry Processes, and to do so the project proposes the coupling of a new Fresnel CSP **Solar thermal collectors (FCSP) system with specially build Hybrid Heat Pumps (HHP)** for a wider output temperature range to increase the potential implementation in industry.

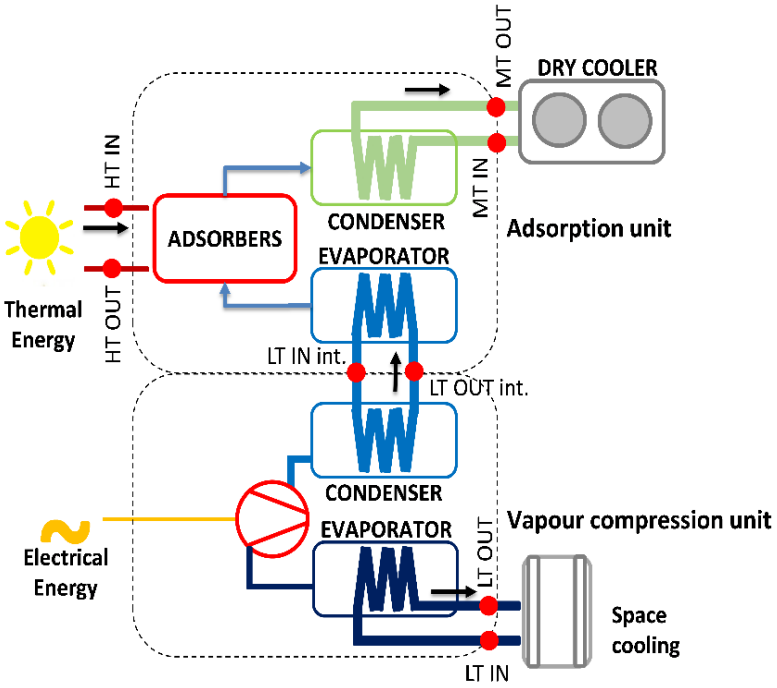
1. **Improve industrial integration** of current Solar Heating Systems;
2. **Achieve a TOTEX cost effective solution**;
3. **Generate trust in the solution** proposed (Chemical and Food Industry).

Energy consumption reduction **up to 75 %**

HHP **electrical EER of 6**

**The efficiency increase up to 25%.**

# Key equipment

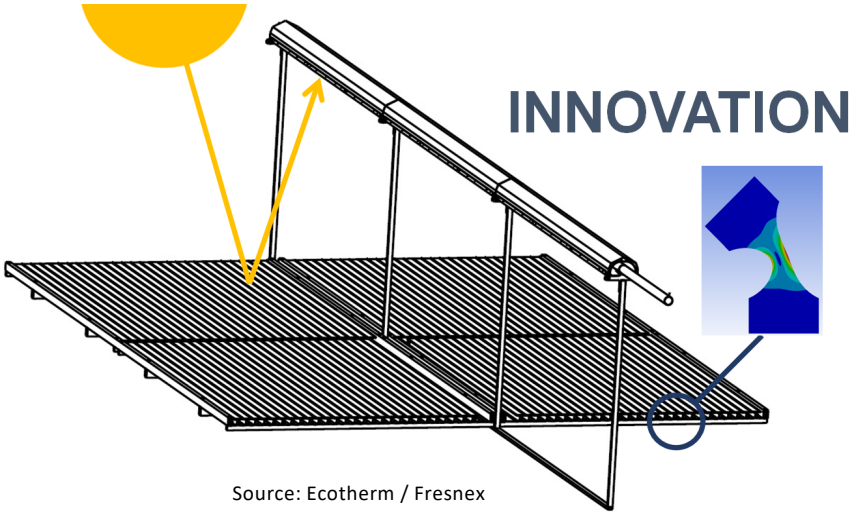



Source: Fahrenheit

## Hybrid sorption/compression system

A sorption module, whose evaporator cools down the condenser of a vapor compression chiller (increased electrical EER)

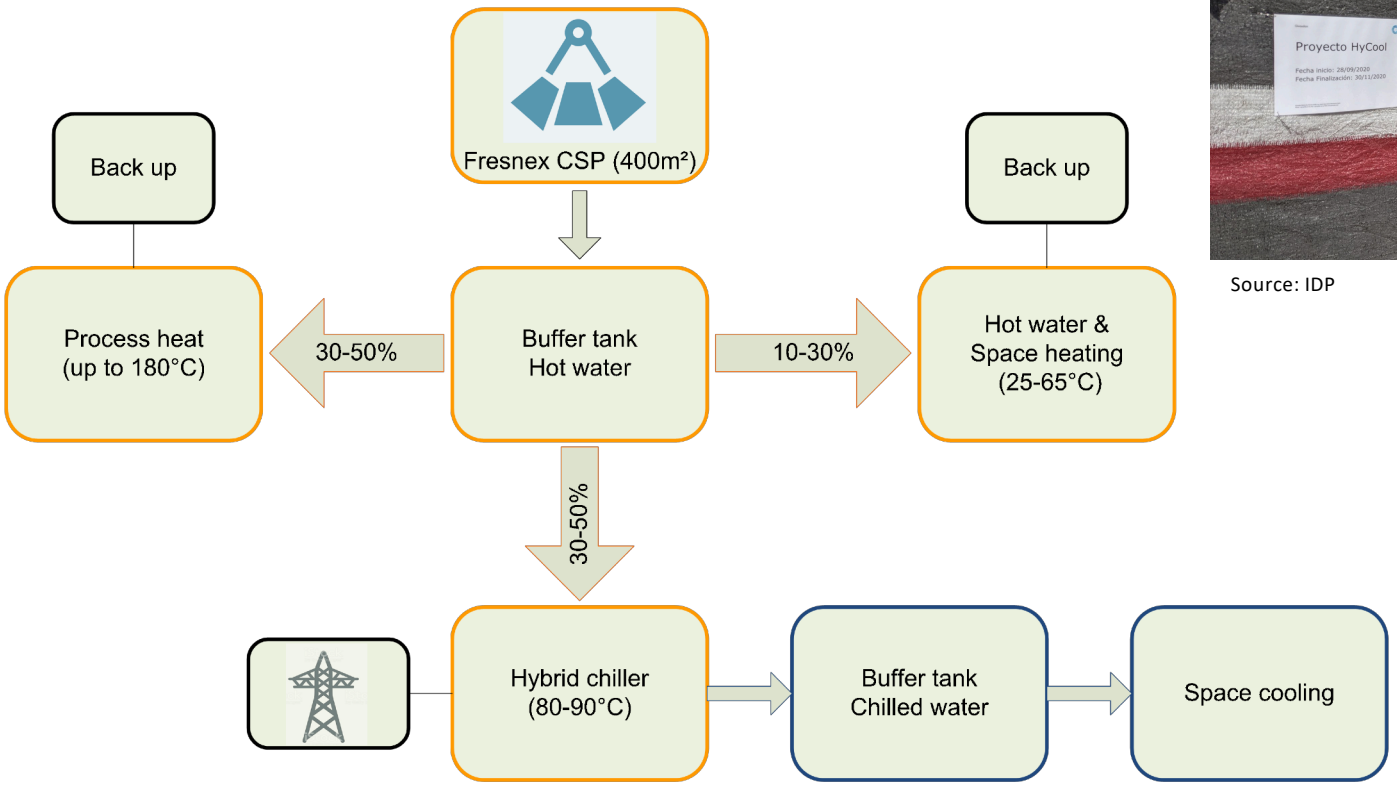
## Solar steam generation (Concentrating solar collectors)




Source: Ecotherm / Fresnex

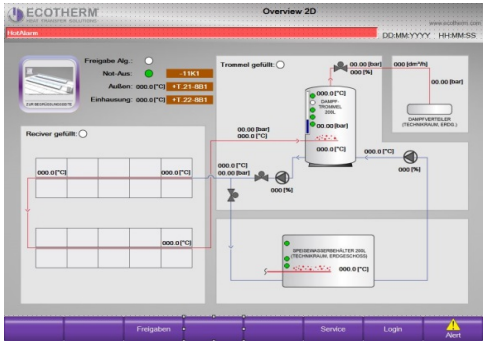
# Integration measures on pilot sites

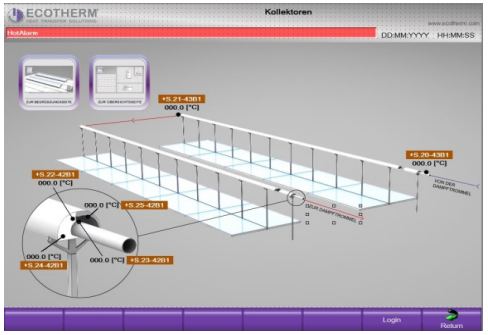
## System integration of solar heat





Source: IDP



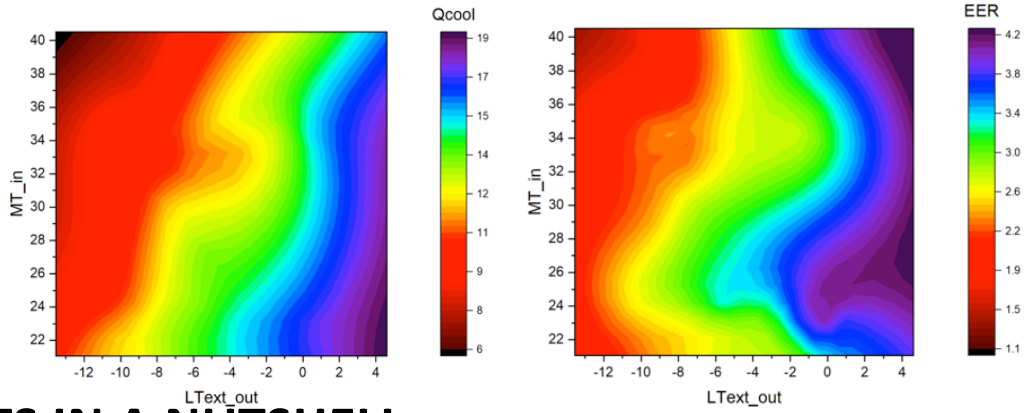

Source: Ecotherm

## Monitoring system

# Testing of HyCool - solution components


Source: ITAE-CNR

- Full performance map
- Definition of reduced models for energy management system implementation
- Evaluation of achievable savings

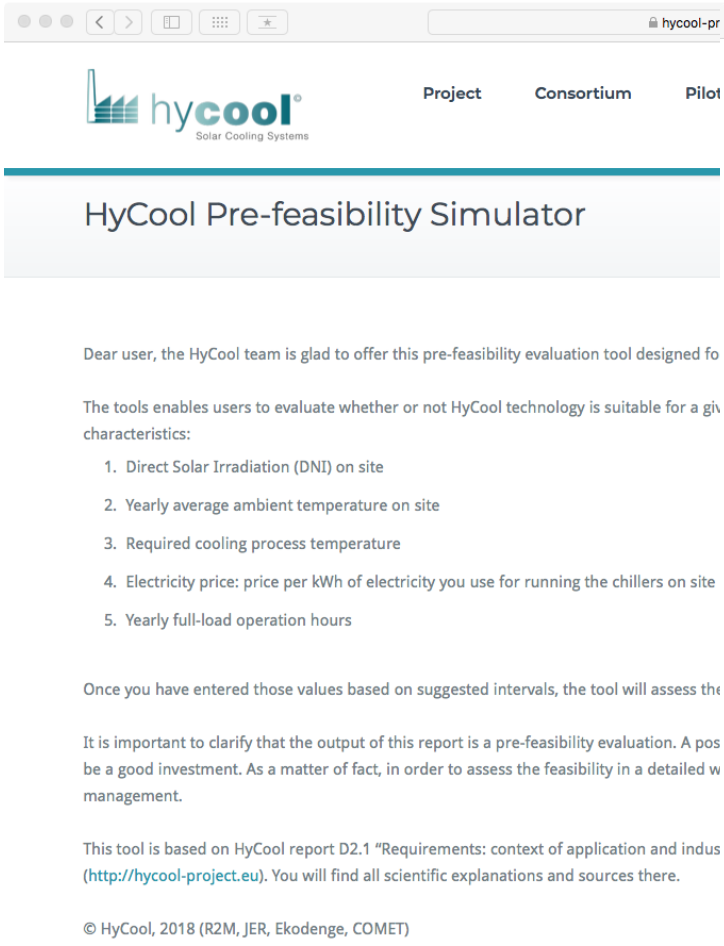


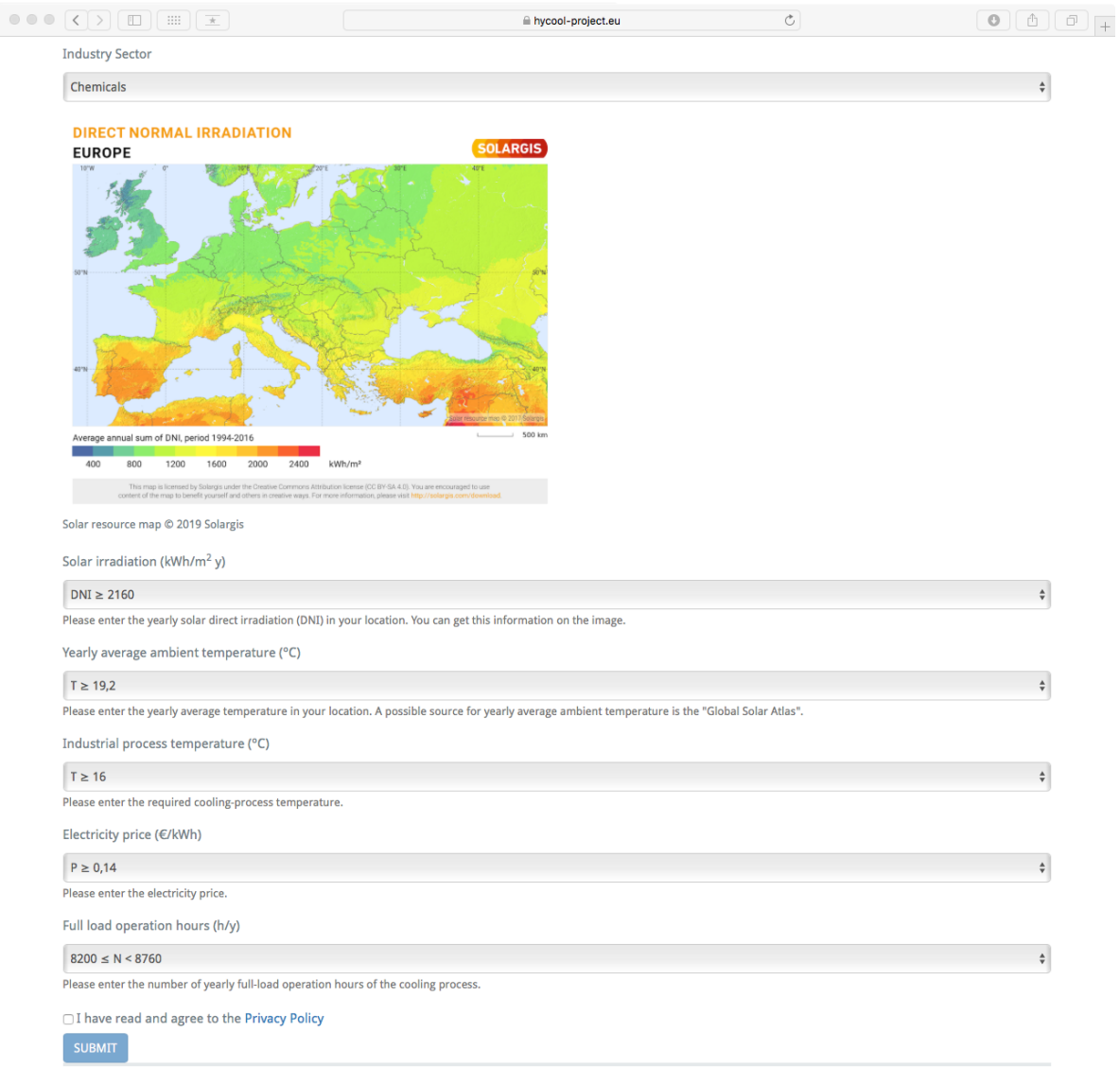

## TESTING RESULTS IN A NUTSHELL

- Cooling capacity between 6 kW and 20 kW according to operating conditions. For standard process cooling operation ($T_{amb}$=30° C, $T_{user}$=4° C), cooling capacity is 17 kW, for refrigeration ($T_{amb}$=30° C, $T_{user}$=-8° C) cooling capacity is 11 kW.
- EER(=cooling output/electricity input) between 1.5 and 4.2. For standard process cooling operation ($T_{amb}$=30° C, $T_{user}$=4° C), EER is 4, for refrigeration ($T_{amb}$=30° C, $T_{user}$=-8° C) EER is 3. Gaining compared to standard compression chillers between **+15% and +25%.**

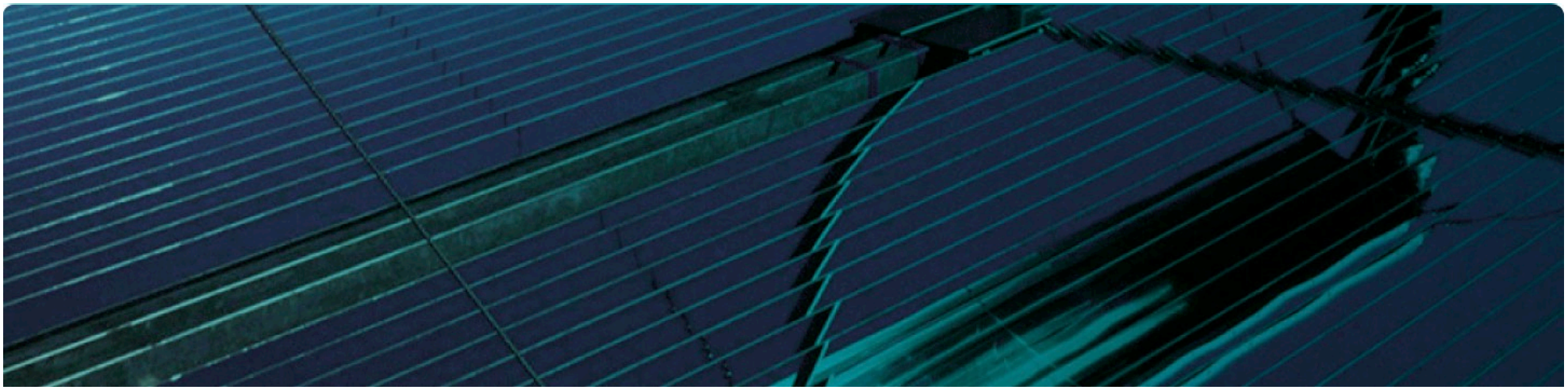
**See also** https://hycool-project.eu/download/experimental-evaluation-of-a-hybrid-adsorption-compression-cascade-chiller-for-solar-cooling-applications-in-industrial-processes/
https://hycool-project.eu/download/poster-on-experimental-evaluation-of-a-hybrid-adsorption-compression-cascade-chiller-for-solar-cooling-applications-in-industrial-processes/

# HyCool Pre-feasibility Simulator tool




## Exploitation / e-learning



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# Thank you for your attention

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