



UNIVERSITA' DEGLI STUDI DI PALERMO

Department of Energy

Buildings and Environment
Energy Systems

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Test rig for small size Solar Ab/Adsorption cooling systems

Research funded by ENEA, programme “Ricerca di Sistema Elettrico”, theme “Utilizzo dell’energia elettrica e solare per condizionamento estivo”

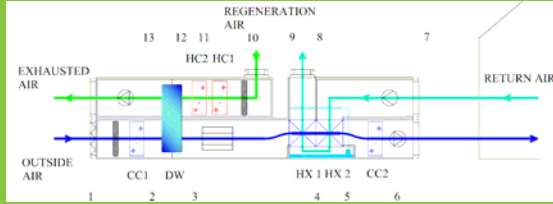
- ❁ Test rig for Ab/Adsorption chillers equipped with solar thermal collectors
- ❁ 35m² evacuated tube collectors
- ❁ Cooling power of the refrigeration machine <15 kW
- ❁ Wide range of simulated load profiles possible
- ❁ Monitoring and Control developed on Labview
- ❁ Monitoring of energy performances according to the procedure developed by the group of experts in the framework of the TASK 38 IEA on Solar Air Conditioning and Refrigeration



Advanced Desiccant and evaporative cooling AHU

Research funded by ENEA, programme “Ricerca di Sistema Elettrico”, theme “Utilizzo dell’energia elettrica e solare per condizionamento estivo”

- ⊗ Cooling and dehumidification obtained by means of a combination of desiccant and evaporative cooling process
- ⊗ Regeneration of desiccant material through the use of heat produced by solar flat plate collector and heat recovery from a compression chiller
- ⊗ Supply temperatures of 20-21°C possible
- ⊗ Electricity consumed is due to the fans, accessories and cold produced by the back-up conventional chiller; energy savings for summer operation are in the range of 50-55%



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3

Other experimental activities on innovative and energy efficient systems and components for air conditioning



- ⊗ Development of a low-cost Solar air collector for integration with desiccant cooling systems

- ⊗ Test rig for innovative for energy efficient air handling systems

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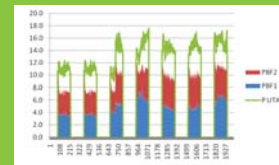
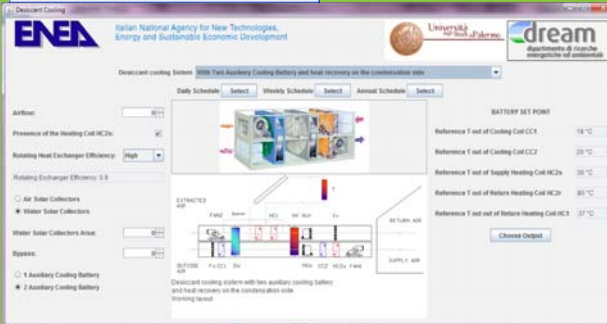
4

Simulation/Design Tools on public platforms Optimal DESIGN for Smart Energy (ODESSE)



Service Interval	ON 1 (h)	OFF 1 (h)	ON 2 (h)	OFF 2 (h)	ON 3 (h)	OFF 3 (h)
Interval 1	00:00	00:00	00:00	00:00	00:00	00:00
Interval 2	00:00	00:00	00:00	00:00	00:00	00:00
Interval 3	00:00	00:00	00:00	00:00	00:00	00:00

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Interval 1	Interval 1	Interval 1	Interval 1	Interval 1	Interval 1	Interval 1	Interval 1



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5

LCA of Solar Cooling Components and Systems



Task 38
Solar Air-Conditioning
and Refrigeration

“Life Cycle Assessment of Solar Cooling Systems”

A technical report of subtask D

Subtask Activity D3

Date: December 2010

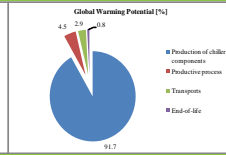
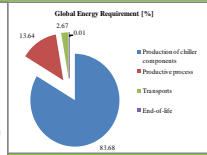
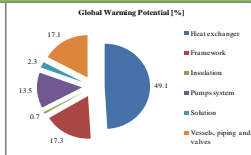
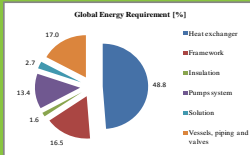
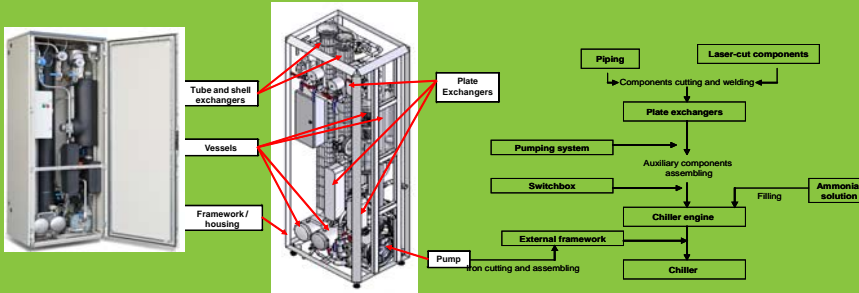
Edited by Marco Beccali¹

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6

LCA of Solar Cooling Components and Systems



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7

Interest/Possible Inputs

⚙ Subtask A: Best Market and Systems

Possible input on a suggested activity: survey of national incentive programmes

Aim: to collect success/failure histories and to eventually suggest best actions to support technologies towards cost-effectiveness

Interest/Possible Inputs

✧ Subtask B: Quality procedures

simplified design tool, detailed design and commissioning procedure, packaging support, monitoring/O&M procedures (for DEC AHUs?)

Interest/Possible Inputs

✧ Subtask C: Certification and contracting

Solar Cooling Quality Label:

- ✧ *definition of the framework/organisation for its management*
- ✧ standardized system minimal performance characterisation
- ✧ monitoring procedure
- ✧ *ex-post* calculation of the energy performance results/integration with national EPBD

Interest/Possible Inputs

⚙ Subtask C: Certification and contracting (Environmental Issues)

⚙ "environmental quality" should be declared through ISO model for Environmental Product Declaration.

An EPD® is an certified environmental declaration developed in accordance with the standard ISO 14025

Environmental Product Declarations (EPD®) add several new market dimensions to inform about environmental performance of products and services with key characteristics and guiding principles

Interest/Possible Inputs

⚙ Subtask C: Certification and contracting (Environmental Issues)

⚙ "environmental quality" should be declared through ISO model for Environmental Product Declaration.

THE INTERNATIONAL EPD®

The Product Category Rules (PCRs) are vital for the concept of environmental declarations and climate declarations. The PCRs enable transparency for the EPD-development and also comparability between differents EPDs based on the same PCR

Interest/Possible Inputs

⊗ Subtask C: Certification and contracting (Environmental Issues)

- ⊗ In order to describe the life cycle performance for a restricted list of selected systems (subtask A) a short set of indicators (and procedures to assess them) can be proposed (i.e. energy and emissions payback time). The model could be similar the one defined in Task 38 subtask D3