



Contract No: TREN/07/FP6EN/S07.68923/038659 HIGH-COMBI

HIGH-COMBI

**HIGH SOLAR FRACTION HEATING AND COOLING SYSTEMS
WITH COMBINATION OF INNOVATIVE COMPONENTS AND
METHODS**

www.highcombi.eu

Instrument: STREP
Thematic Priority: Sustainable Energy Systems

Workpackage WP 6, Deliverable D23

German National Workshop Report

Due Date: December 2011 (Month 55)
Submission Date: November 2011 (Month 11)

Start date of project: June 1st, 2007
Duration: 55 months

Lead contractor for this deliverable:
Centre for Renewable Energy Sources and Saving (CRES)

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission)	
RE	Restricted to a group specified by the consortium (including the Commission)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

TITLE OF THE WORKSHOP

ADDRESS / DATE OF EVENT

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1. WORKSHOP TABLE FACT SHEET

Event type	National Workshop on solar cooling		
Event title	Solare Kühlung und Klimatisierung		
Date	October 27, 2011	Time	09:00 a.m. – 02:30 p.m.
Event organisers	Staatsbetrieb Sächsisches Immobilien- und Baumanagement (SIB), Fraunhofer ISE		
Address	Sächsisches Staatsministerium der Finanzen, Carolaplatz 1		
City	01097 Dresden	Country	Germany
No. Attendees	23		

2. OVERVIEW - MAIN OBJECTIVES OF THE EVENT

The German National Workshop on Solar Cooling in the High Combi project was held in co-operation with

Staatsbetrieb Sächsisches Immobilien- und Baumanagement (SIB)
Wilhelm-Buck-Straße 4, 01097 Dresden

Place of Presentation was

Sächsisches Staatsministerium der Finanzen
Carolaplatz 1
01097 Dresden

SIB represents the Federal State Saxony as authority for all kinds of public buildings, such as Universities, financial departments, law courts, etc. The participants of the Workshop thus were covering a wide range of responsibilities in the building area, e.g., real estate project management, building planning, organisation, commissioning, facility management.

In general, the public building sector is of high interest for solar cooling applications; installations made in this sector show a high potential to attract awareness to new solutions, e.g. in building air-conditioning. Real estate managers, Planners, facility managers of the SIB are well networked through the organisation and thus, informations provided are expected to be spread quickly in a broad scale. For this reason, SIB was assumed as an appropriate platform for the dissemination of the state of the art of Solar Cooling within a workshop.

3. DESCRIPTION OF THE EVENT

The presentations on solar cooling were presented by Dr. Alexander Morgenstern from Fraunhofer ISE.

Starting with a motivation to go for solar cooling, the workshop continued with a presentation of the technologies, available for solar cooling. Closed cycle technologies (chilled water technologies, using either absorption or adsorption techniques) were outlined as well as open cycle technologies for direct treatment of supply air (desiccant evaporative cooling techniques) and their different classification into solid and liquid sorption processes. For each type of technology, examples on available components were given.

Subsequently, system related aspects were presented, beginning with different types of solar thermal collectors and their application within solar cooling. In a technology selection scheme, decision support to select the appropriate technology for a given air-conditioning task was given.

To support the system planning, primary energy aspects were outlined and critical issues on auxiliary electricity demand in solar cooling systems in this context discussed. This is also one of the main important issues in the High Combi project.

During the presentation of system realisations, installation examples within High Combi were shown and the project goals were outlined. The workshop closed with trends and an outlook on solar cooling.

The presentations were split into three slide sets with a total of 220 slides.

4. ATTENDEES PROFILE

The 23 participants of the Workshop covered a wide range of responsibilities in the building area, e.g., real estate project management, building planning, organisation, commissioning and facility management. Most of the settlements of the SIB in Saxony were represented by participants as well.

A list of participants is included in the annex.

5. EVALUATION OF THE EVENT

The participants appreciated the quality of the presentations, which were well and clearly arranged ranging from basic principles of thermally driven cooling, market available techniques, planning aspects to economic issues and examples on installations.

The interest on the subject as well as the relevance to the work environment of the participants was high. However, the duration of the workshop was assumed as a little bit too long.

Possibilities on solar cooling were already discussed among some of the participants before, however, the high investment cost are still the major barrier in the application of this technology. This holds also, even if the life cycle cost may be not so far above the costs of competitive systems.

A handout of the slides was disposed to the participants. The organisation of the workshop by SIB was smooth and effective.

6. CONCLUSIONS

Regional or Federal building authorities such as SIB form a very interesting target group for dissemination activities on solar cooling or other renewable energy based energy supply options, since they have influence on the refurbishment, upgrading, building and use of real estates in a large scale.

Due to the wide range of expertise of the participants, the presentations covered technical principles as well as economical and market related aspects, which was well appreciated. The economic situation of solar cooling is seen still as a bottleneck in the market growth of this technique.

A workshop on solar cooling for this mixed target group should not exceed ½ day; several breaks for discussion should be included.

ANNEXES

General content of the Workshop:

- **Motivation for solar cooling**
- **Technologies**
 - Heat transformation
 - Closed cycles
 - Absorption
 - Principle, state of the art, market
 - Adsorption
 - Principle, state of the art, market
 - Open cycles
 - Solid sorption processes
 - Liquid sorption processes
 - Process description
- **Systems**
 - Collectors
 - Temperature conditions
 - Construction principles (collector types, freezing protection, etc.)
 - Concentrating collector technologies
 - efficiencies
 - Selection of technology
 - General decision scheme
 - Examples of different solutions
 - Barriers in market development
 - Economics: component costs, system costs
 - Planning aspects
 - Heat rejection
 - Primary energy demand
 - Implications for solar cooling planning and configuration
 - Planning support tools
- **Examples**
 - High Combi: Project aims and partners
 - High-Combi installation examples (2 Austrian systems)
 - Various examples on closed and open cycle solar cooling systems, presenting installation photos, system schemes, monitoring results etc.
- **Trends and outlook**



Presenter: Dr. Alexander Morgenstern (Fraunhofer ISE)



One of the presentation slides (High Combi System at S.O.L.I.D., Graz, Austria)

Absorptionskältemaschinen – Stand der Technik

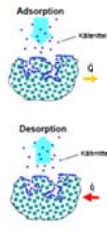
Nutzung der Absorptionstechnik in Deutschland

- > Industrielle Anwendung, Nutzung von Abwärme
- > zentrale Kälteversorgung in großen Einheiten (z.B. in Kältenetzen, Antrieb mit BHKW-Abwärme, Fernwärme)
- > Bisher geringer Anteil an Gesamtkälteerzeugung (Statusbericht DKV Nr. 22, 2002: < 2%), aber durch neueren Aufbau in Kältenetzen vermutlich wachsend

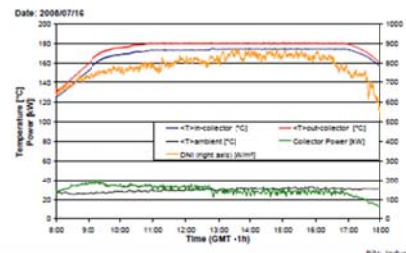


Absorption – grundlegender Prozess

- Anlagerung von Gasmolekülen auf der inneren Oberfläche von hochporösen Feststoffen
- Typische Porengröße: 0.5 – 2 nm
- „innere Oberfläche“: 300-1200 m² pro Gramm
- Sorptionsmaterialien: Silikagel, Zeolith, Aktivkohle, aktiviertes Aluminium
- Reversible Bindung, d.h. der Arbeitsstoff (Kältemittel) kann periodisch adsorbiert und desorbiert werden
- Dieser Effekt kann benutzt werden, um einen geschlossenen Kreisprozess durch aufeinander folgende Phasen der Adsorption und Desorption zu realisieren



Fresnel-Kollektor, Temperaturnachführung (Beispiel)

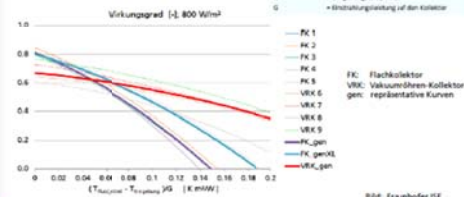


Kollektorwirkungsgrade

- Übliche Darstellung (für Sonnenposition senkrecht zum Kollektor; Gleichgewichtszustand)

Ansatz (näherungsweise; stationärer Zustand)

- $\eta = \eta_{opt} - \rho_{opt} \left(\frac{T_{Kollektor} - T_{amb}}{T_{amb}} \right) - \rho_{opt} \left(\frac{T_{Kollektor} - T_{amb}}{T_{amb}} \right)^2$
- ρ_{opt} = Einstrahlungswirkungsgrad
- ρ_{amb} = optischer Wärmeverlust
- ρ_{opt} = optischer Wärmeverlust
- ρ_{amb} = mittlere Kollektortemperatur
- T_{amb} = Umgebungstemperatur
- $T_{Kollektor}$ = Einstrahlungstemperatur des Kollektors

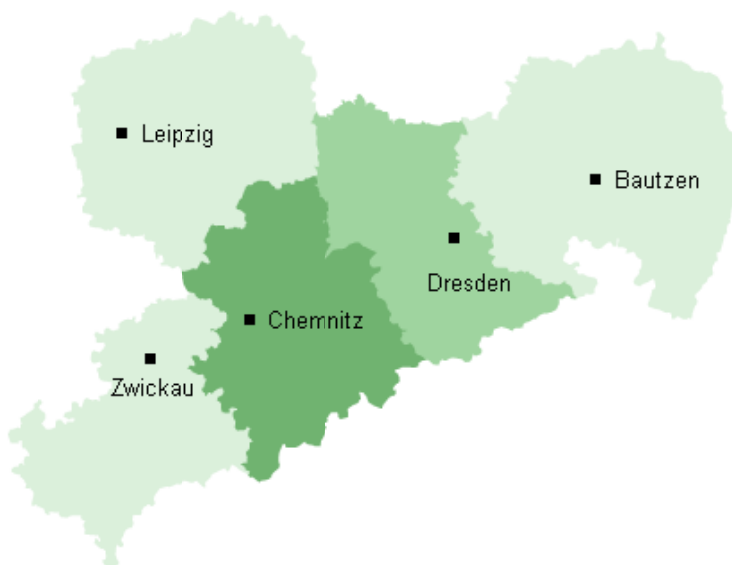


Excerpt from the prints, issued to the participants

Anwesenheitsliste Seminar "Solare Kühlung"
27.10.2011 im SMF, Raum 402

Nr.	Name	Vorname	Niederlassung	Unterschrift
1	Müller	Stefan	Dresden I	
2	Schreiter	Anita	Dresden I	Schreiter
3	Reichel	Annette	Chemnitz	Reichel
4	Abdennabi	Sabine	Chemnitz	Abdennabi
5	Kluge	Heiko	Chemnitz	Kluge
6	Enderlein	Maik	Chemnitz	Enderlein
7	Pehl	Stefan	Zentrale	Pehl
8	Schubert	Sven	Zentrale	Schubert
9	Hartwig	Jan	Zentrale	Hartwig
10	Geißler	Bernd	Leipzig I	Geißler
11	Schmidt	Wolfgang	Leipzig I	Schmidt
12	Simon	Wilfried	Leipzig I	Simon
13	Ebersbach	Evelin	Leipzig I	Ebersbach
14	Richter Götting	Ingo Cornelia	Dresden II	Götting
15	Köckeritz	Jens	Dresden II	Köckeritz
16	Höfig	Silke	Dresden II	Höfig
17	Tiedt	Christiane	Dresden II	Tiedt
18	Grätz	Roland	Bautzen	Grätz
19	Ließner	Martin	Bautzen	Ließner
20	Miesner	Stefan	Bautzen	Miesner
21	Wildenhayn	Ingo	Leipzig II	Wildenhayn
22	Neuber	Bianco	Leipzig II	Neuber
23	Klein	Birgit	Leipzig II	Klein
24	Melzer	Rainer	Dresden II	Melzer

List of participants



Settlements of the SIB in the Federal State Saxony