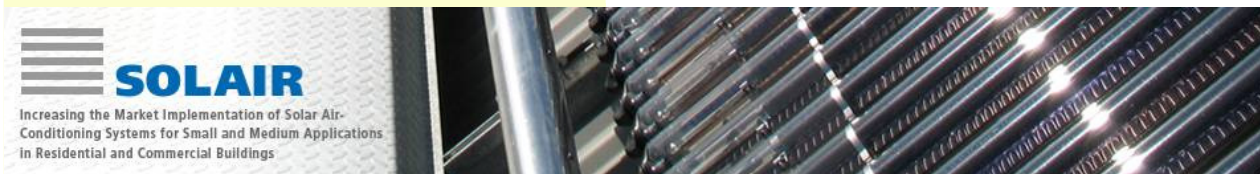


Training measures : objectives & events

Daniel Mugnier, TECSOL

Bilbao

21 February 2008





solarcombi+

Common meeting SOLARCOMBI+ / SOLCO / SOLAIR

Intelligent Energy  Europe

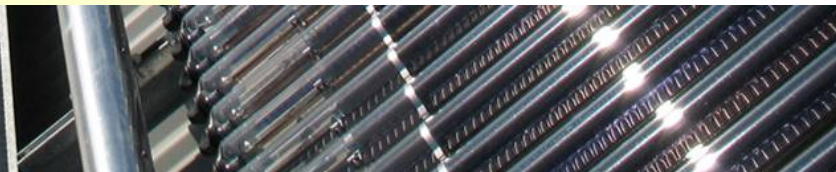
Content

- **Goals, concept & synergies**
- **Planning**
- **Development of material**
- **Organisation events/courses**



SOLAIR

Increasing the Market Implementation of Solar Air-Conditioning Systems for Small and Medium Applications in Residential and Commercial Buildings



tecsol
tecsol



solarcombi+

* **Goals** : To create a comprehensive set of training units and didactic material. For the participating countries, training courses will be prepared and evaluated through pilot courses.



Practical training



Real installation feedback

* **Audience** : Supply side

- SOLAIR : plant designers, engineers, technicians and installers
- SOLARCOMBI+ : installers (+ planners)



SOLARCOMBI+ : WP5 Training on package solutions

* **Task 5.1** **Preparation of training materials**

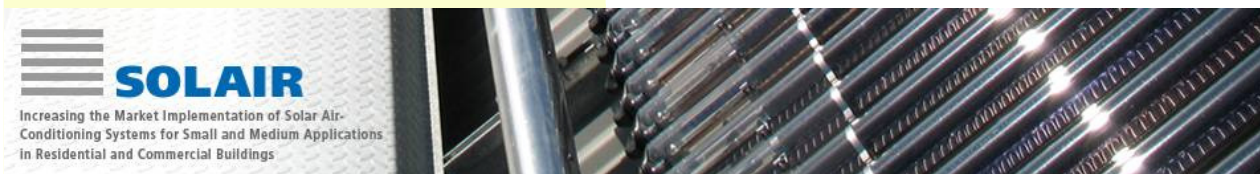
Inputs from Manufacturers and especially from WP4 (month 20 = May 2009)

* **Task 5.2** **Implementation of pilot trainings**

3 pilot training courses/industry partner for 20-30 people => 350 installers

2 day course : 1 theory + 1 practice

* **Task 5.3** **Evaluation of the trainings** (Report on pilot training courses, recommendations for optimisation)





solarcombi+

Time schedule of SOLARCOMBI+

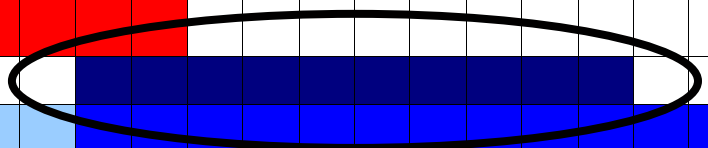
Sept 2007



March 2009



Project phase / Duration of the project (in months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Work package 1: Management	[Grey shaded]																															
Work package 2: Market analysis	[Green shaded]																															
Work package 3: Virtual case studies	[Yellow shaded]																															
Work package 4: Determination of standard applications and most promising markets	[Red shaded]																															
Work package 5: Training on package solutions	[Blue shaded]																															
Work package 6: Dissemination and Communication	[Light blue shaded]																															
Work package 7: Common Dissemination Activities	[Purple shaded]																															
Project meetings ^a	x						x						x							x			x							x		
Project reports to IEEA ^b										PR										IR											FR*	
Project deliverables ^c			D6.1 D6.5				D2.1 D2.2 D2.3 D2.4	D2.5 D6.5			D6.2		D3.1 D3.2 D3.3			D4.1		D2.6 D2.7			D4.2 D4.3 D4.4 D4.5 D4.6 D4.7 D4.8 D4.9 D4.10 D6.2		D5.1 D5.2 D5.3 D5.4 D5.5 D5.6 D6.3 D6.5 D6.9						D5.7 D5.8			D1.1 D6.2 D6.4 D6.6 D6.7 D6.8 D6.10 D6.11 D6.12 D6.13



SOLAIR : WP3 Capacity building and training activities

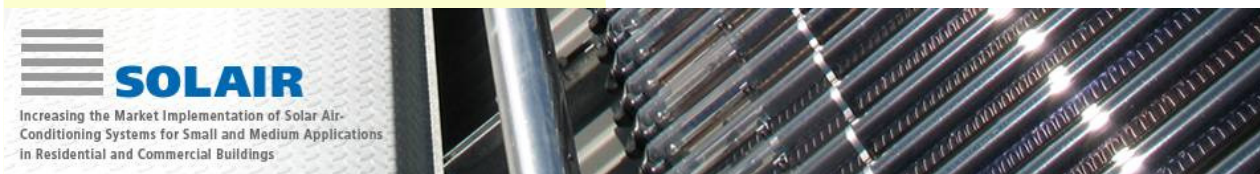
*** Task 3.1 Definition of standard training modules, development of a didactic material base and course concepts**

*** Task 3.2 Implementation and evaluation of pilot training courses for professionals and technicians in the participating countries**

Organisation and implementation of two pilot training courses per partner country for professionals and technicians (DE, AT, IT, GR, PT, ES, FR, SI)

*** Task 3.3 Production and distribution of training materials**

Didactic guidelines. Master version in English (electronic data base form) = basis for the preparation of the country versions.





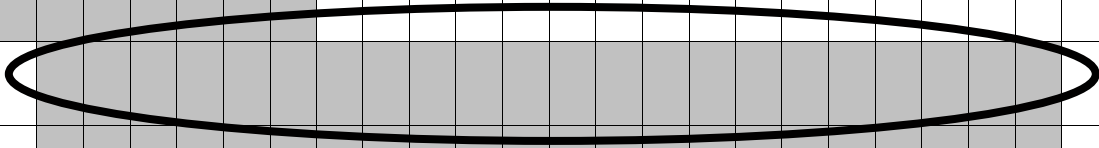
solarcombi+

Time schedule of SOLAIR

Jan 2007

Autumn 2008

phase / Duration of act (ths)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
ackage 1: co-ordination and ment																																						
ackage 2: review and analysis l and medium-sized pliances																																						
ackage 3: y building and activities																																						
ackage 4: tion and awareness campaign towards market actors																																						
ackage 5: nication and nation																																						
ackage 6: n dissemination :s																																						
meetings ^a	x					x						x						x							x												x	
t reports to EC ^b									PR										IR										PR								FR	
t deliverables			D 19				D 6						D 9	D 7	D 8	D 10	D 11		D 14	D 12				D 15	D 13							D 16	D 21	D 18	D 22	D 20	D 23	D 24





SOLAIR COURSE...

Duration : 1 day theoretical course + ½ day technical tour (optional)

1st day : Theory

Schedule :

Start : 9 am

End : 6 pm

A) Introduction

B) Basics

C) Predesign

D) Design

E) Economics & environment

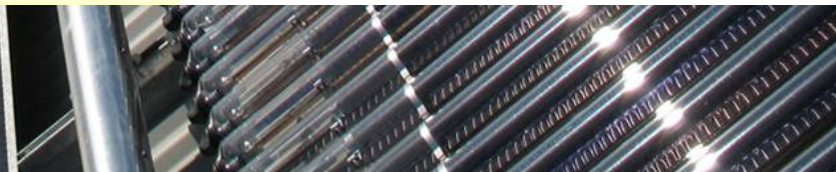
F) Realised systems and best practice examples

2nd day : Visit

If a solar cooling system is close to the training course site, a visit can be interesting. It can be coupled with a visit of a large solar domestic hot water system to show the large solar collector fields.



Increasing the Market Implementation of Solar Air-Conditioning Systems for Small and Medium Applications in Residential and Commercial Buildings





solarcombi+

Common meeting SOLARCOMBI+ / SOLCO / SOLAIR

Synergies

Intelligent Energy  Europe

SOLARCOMBI+

Day1 : Theory

Morning :

- A) Introduction (15 min)
- B) Basics (1h30)
- C) Predesign (0h30)
- D) Economics (0h30)
- E) Realised systems (0h30)

Afternoon :

- A) Concept (30 min)
- B) Technical descriptions (2h)
- C) Realised applications (1h)
- D) Debriething (45 min)

Day 2 : Practice day

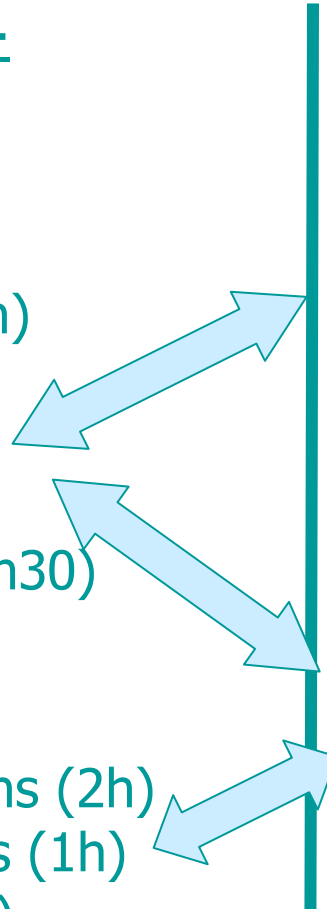
SOLAIR

Morning :

- A) Introduction (15 min)
- B) Basics (1h45)
- C) Predesign (1h15)

Afternoon :

- A) Design (1h30)
- B) Economics & environment (1h)
- C) Realised syst. & best practice (1h30)
- D) Debriething (15 min)



And additional inputs from SOLCO...



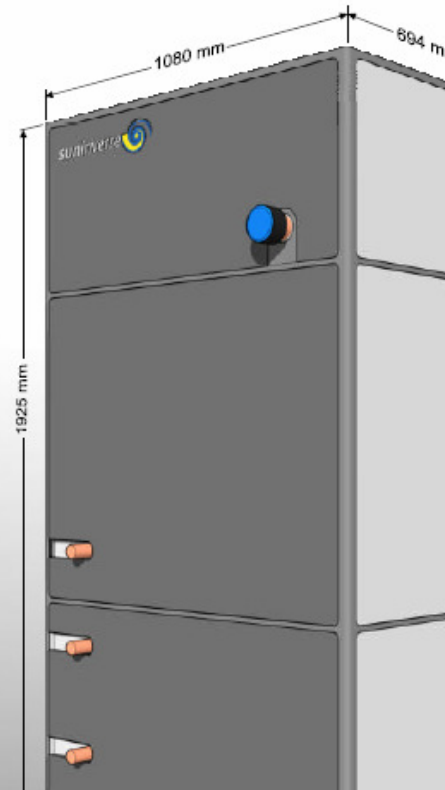


solarcombi+

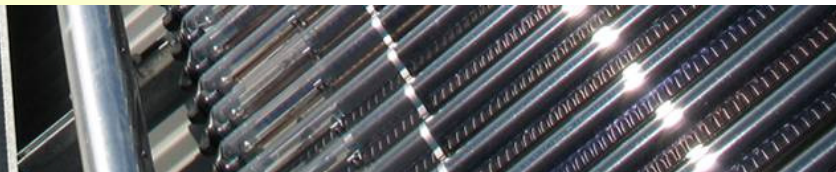
SOLARCOMBI+ training course draft example (Sonnenklima)

Content

- The idea
- Technical part
- Applications
- Regional aspects
- Next steps



Increasing the Market Implementation of Solar Air-Conditioning Systems for Small and Medium Applications in Residential and Commercial Buildings





solarcombi+

SOLARCOMBI+ training course draft example (Sonnenklima)

A) Concept (30 min) :

- * presentation of the chiller company
- * targets
- * advantages of the product

suninverse **The Chiller- Reached Goals**

- COP increased from 0,70 to 0,78
- driving temperature for 10 kW reduced from 95°C to 75°C
- external vacuum pump replaced by vacuum holding

The Idea
Technical part
Applications

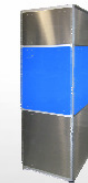
• t reduction
• ign
• different

Our Solution

suninverse

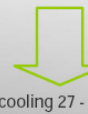
a small unit with low driving temperature, good efficiency and low electrical energy consumption

driving temperature 55 - 105 °C



cold water 6 - 16 °C

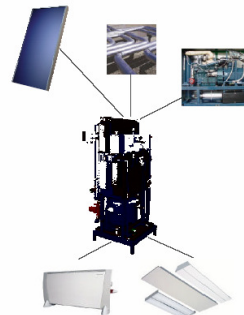
recooling 27 - 45 °C



The Idea
Technical part
Applications
Regional aspects
Next steps

Possible System Applications

- Heat sources:
- solar thermal
 - district heating
 - CHP (Combined Heat and Power)



Absorption Chiller

Cold distribution: Standard systems can be used

The Idea
Technical part
Applications
Regional aspects
Next steps

History

- **Starting 2000**
Phönix SonnenWärme AG develops a solar cooling system in cooperation with ZAE Bayern and TU Berlin (3-year EU-project).
- **2003**
Starting pilot projects in Europe.
- **2005**
4th generation prototypes start running in demonstration projects.
- **2006**
Founding SK SonnenKlima GmbH. Rights are secured by patents for important details.

We install pilot systems for different applications.

Our next goal is a serial product.

Applications suninverse

- private houses
- small trade units
- office applications
- ...

Living space:
10 kW ~ 180 m²
16 kW ~ 290 m²

solar plant:
flat plate collector ~40 m²
vacuum tube collector ~30 m²

The Idea
Technical part
Applications
Regional aspects
Next steps



The Idea
Technical part
Applications
Regional aspects
Next steps



Increasing the Market Implementation of Solar Air-Conditioning Systems for Small and Medium Applications in Residential and Commercial Buildings





solarcombi+

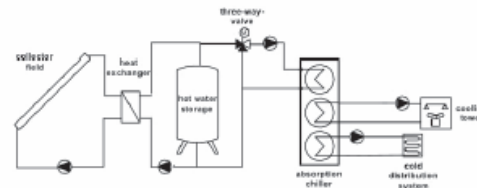
SOLARCOMBI+ training course draft example (Sonnenklima)

B) Technical descriptions (2h)

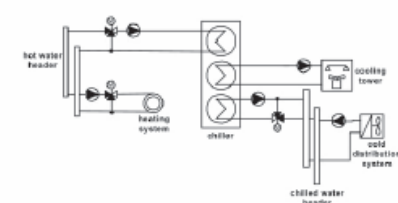
- * chiller
- * installation
- * operation
- * maintenance

Recommended system structure

(A) Solar cooling



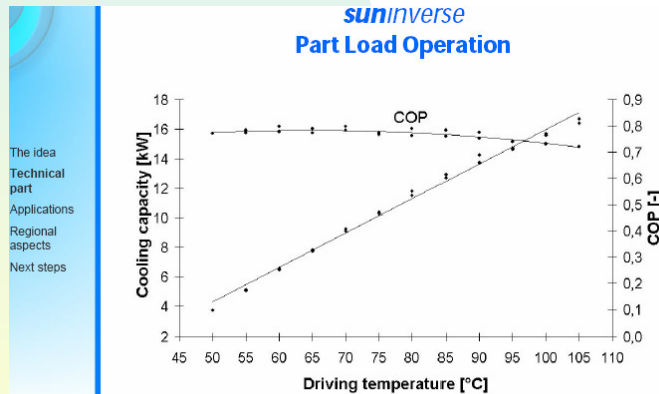
(B) District heating or CHP (combined heat and power unit)



SK SonnenKlima GmbH | Am Treptower Park 28-30 | 12435 Berlin | Germany

www.sonnenklima.de | info@sonnenklima.de | Tel. +49 (0) 30 53 00 07 700 | Fax. +49 (0) 30 53 00 07 17

specifications	unit	suniverse	
		operation with fan-coils	operation with ceiling
refrigerating capacity nominal/maximal	kW	8,8 / 11,7	10 / 15,8
	USRT	2,5 / 3,3	2,8 / 4,5
	BTU/h	30026 / 39932	34120 / 53925
chilled water circle	temperature nominal/maximal (out - in)	°C	6-12 / 15-18 / 15-20
	mass flow nominal/maximal	m ³	1,3 / 1,7 / 2,9
	internal pressure drop	mbar	350
	connection		1" outside thread
hot water-circle	temperature nominal/maximal (in)	°C	85 / 95 / 75 / 95
	mass flow nominal/maximal	m ³ /h	1,2 / 1,2
	internal pressure drop	mbar	200
	connection		¾" tube
cold water-circle	temperature nominal/maximal (in - out)	°C	35-27 / 36-27 / 35-27 / 39-27
	mass flow nominal/maximal	m ³ /h	2,6 / 2,6
	internal pressure drop	mbar	320
	connection		1" outside thread
electrical connection	voltage	V	230 V ~ 1 ph 50Hz
	solution pump	W	70
	refrigeration pump	W	50
dimensions	height H	mm	1900
	width B	mm	1080
	depth T	mm	695
weight	operation	kg	550
	transport	kg	500



$$\text{COP} = \text{Coefficient of performance} = \frac{\text{Refrigeration power}}{\text{Driving power}} = 0,78$$

1 kWh input energy and a COP of 0,78 equal 0,78 kWh refrigeration power.



Increasing the Market Implementation of Solar Air-Conditioning Systems for Small and Medium Applications in Residential and Commercial Buildings





solarcombi+

SOLARCOMBI+ training course draft example (Sonnenklima)

C) Realised applications (1h) :

- * description
- * results

The idea
 Technical part
 Applications
 Regional aspects
 Next steps

Operational Results and Experiences

- More than 15.000 operation hours
- Long term (about 5 years) operation of system proved
- COP and performance data proved
- Control solutions for different systems
- Remote supervision system

The idea
 Technical part
 Applications
 Regional aspects
 Next steps

Solar Cooling



Installation on top of the building of Phönix Sonnenwärme AG

Solar Cooling

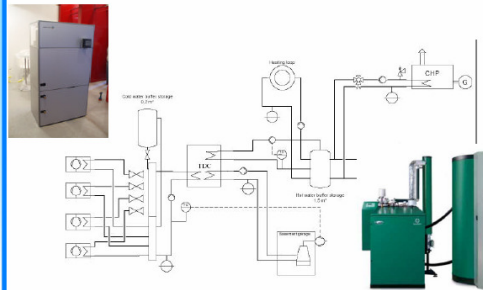


Installation, CUT Osnaabrück

The idea
 Technical part
 Applications
 Regional aspects
 Next steps

Cooling and CHP

The idea
 Technical part
 Applications
 Regional aspects
 Next steps



Cooling by District Heating



AKM Installation Mannheim, district heating




 Increasing the Market Implementation of Solar Air-Conditioning Systems for Small and Medium Applications in Residential and Commercial Buildings

