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# Solar Air-Conditioning

**Rome Airport, Italy**  
**Thursday, September 24th, 2015**  
**Friday, September 25th, 2015**



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**Rome** is the city with the highest concentration of historical and architectural riches in the world.

**The conference venue** is located in Fiumicino a small city in the province of Rome. The hotel is next to the Leonardo da Vinci International Airport. For hotel guests there is a shuttle service available to and from Rome City Center and the Airport.

### **Leonardo da Vinci Rome Airport Hotel**

Via Portuense, 2470  
00054 Fiumicino/Rome  
Italy  
[www.romeairporthotel.it](http://www.romeairporthotel.it)  
[info@romeairporthotel.it](mailto:info@romeairporthotel.it)

The sixth International Conference on Solar Air Conditioning concludes the first decade of high level exchange on solar cooling science and technology. Renewable energies have dramatically increased their market share during the last years and many countries now approach 30% of renewable electricity and about 10 to 15% of renewable heat in the national energy mix. This has led to strong reduction in prices, especially for solar photovoltaics, while the solar thermal market only slowly gains importance. Cooling and air conditioning was always an optimal application for solar energy use, as the temporal coincidence between cooling need and solar energy conversion is better than most other uses of solar energy. In countries with cooling dominated climates solar air conditioning is an excellent technology to provide high own consumption of solar energy, offering interesting economic solutions, especially if electricity prices are high and long cooling operation hours are needed. While photovoltaic cooling seems to take the lead in reducing cooling costs, solar thermal cooling technologies offer more flexible and low cost thermal storage and show reliable and stable operation with a long machine lifetime. A major advantage is the strong reduction of stress on the electrical networks, which often suffer due to high peak cooling loads during summer conditions. Trigeration systems obtained when coupling cogeneration units with thermal cooling systems are also attractive solutions for highly efficient and economic cooling and can be supported with solar thermal energy. Italy with its significant cooling requirements and its advanced refrigeration industry is an excellent host of the 2015 Solar Air Conditioning Conference. Following the 3rd Conference hosted in Palermo 2009, the 6th Conference returns to Italy to celebrate 10 years of successful networking of solar cooling researchers, industrial companies and technology developers. Rome as the conference location lies in the center of Italy's leading economic region and is a well known host of many events on refrigeration and air conditioning.

### **Prof. Dr. Ursula Eicker**

University of Applied Sciences Stuttgart, Germany

## Conference Chairwoman

### **Prof. Dr. Ursula Eicker**

University of Applied Sciences Stuttgart, Germany

## Scientific Committee

### **Dr. Constantinos A. Balaras**

Group Energy Conservation, Institute for Environmental Research & Sustainable Development, National Observatory of Athens, Greece

### **Prof. Marco Beccali**

Dept. of Energy, Information Engineering and Mathematics Modeling (DEIM) Università degli Studi di Palermo, Italy

### **Prof. Alberto Coronas**

Universitat Rovira I Virgili, Tarragona, Spain

### **Prof. Yan Jun Dai**

Shanghai Jiao Tong University, China

### **Prof. Dr. Hans-Martin Henning**

Fraunhofer ISE, Freiburg, Germany

### **Dr. Daniel Mugnier**

Tecsol SA., Perpignan Cedex, France

### **Prof. Dr. Christian Schweigler**

University of Applied Sciences Munich, Germany

### **Prof. Dr.-Ing. Wolfgang Streicher**

University of Innsbruck, Institute for Structural Engineering and Material Sciences, Innsbruck, Austria

### **Dr. Kyriakos Tsiiftes**

University of Cyprus, Nicosia, Cyprus

### **Dr. Stephen White**

CSIRO Energy Technology Newcastle, Australia

## Conference Focus

- Development of technologies
- Know-how transfer
- Identification of R&D needs
- Exchange of results and ideas

## Your Advantage

- You gain comprehensive information about the state of technology as well as latest results from research and development.
- The scope of the conference is intended to encourage a hearty open discussion of problems and future strategies to spread Solar Air-Conditioning.
- The speakers are leading scientific and business experts.
- The programme structure and the conference venue best ensure intensive experience-sharing between participants and presenters.
- The detailed proceedings book with all talks and poster contributions will be handed over at the start of the conference and will serve you well as reference works.

## Workshop on

### The New Generation Solar Cooling & Heating Systems (PV or solar thermally driven systems) / IEA SHC Task 53

Leonardo da Vinci Hotel Rome Airport, September 23, 2015, 14.00 – 17.30 hrs

#### Seminar Chairman:

**Dr. Daniel Mugnier, Operating Agent, IEA SHC Task 53**

Whereas renewable cooling is more and more an hot topic in the World energy issues, a new generation of solar cooling systems is appearing from labs and in the market. Consisting both in solar thermal or photovoltaic, the concepts are oriented to cost reduction and reliability. A new IEA Solar Heating and Cooling programme name Task 53 is exactly addressing this New generation.

The IEA SHC Task 53 workshop will be dedicated in presenting the latest developments and new appearing products and systems. The presentations will be mixing industry developments and concepts as well as R&D institutes research results

The workshop is free of charge for participants of the conference.

Please register via: <http://www.otti.eu/registration/SAC-4880/>

## 6<sup>th</sup> International Conference Solar Air-Conditioning

Thursday, September 24<sup>th</sup>, 2015

- 09.30 Opening Address  
Gabriele Struthoff-Müller, OTTI, Regensburg, Germany  
**Conference Chairwoman Ursula Eicker, University of Applied Sciences Stuttgart, Germany**

### OPENING SESSION

**Chair: Marco Beccali, Information Engineering and Mathematics Modeling (DEIM), Università degli Studi di Palermo, Italy**

- 09.45 Market and technology development of solar cooling in Italy  
Livio de Santoli, AICARR, Rome, Italy
- 10.05 Successful large scale projects on solar cooling - energetic and economic performance  
Christian Holter, Solid, Graz, Austria
- 10.25 New Generation solar cooling and heating systems with IEA SHC Task 53: overview and first results  
Daniel Mugnier, Tecsol S.A., Perpignan, France

- 10.45 Discussion
- 11.00 Coffee Break

### SESSION 1: THERMALLY DRIVEN SOLAR AIR CONDITIONING COMPONENTS, PART 1

**Chair: Christian Schweigler, Munich University of Applied Sciences, Germany**

- 11.45 Experimental evaluation of an ammonia-lithium nitrate absorption cooling system  
Wilfrido Rivera, Universidad Nacional Autónoma de México Instituto de Energías Renovables, Temixco, Morelos, México
- 12.00 Experimental experiences with an enhanced directly air-cooled water/LiBr absorption chiller  
Myrea Richter, ILK Dresden, Dresden, Germany
- 12.15 Experimental performance of a chemisorption chiller driven by hot water with temperature up to 75 °C  
Rogério Gomes Oliveira, Federal University of Santa Catarina, Araranguá, Brazil
- 12.30 Discussion
- 12.45 Lunch and visit to the poster exhibition

### SESSION 2: THERMALLY DRIVEN SOLAR AIR CONDITIONING COMPONENTS, PART 2

**Chair: Alberto Coronas, Universitat Rovira I Virgili, Tarragona, Spain**

- 14.15 Modeling and experimental study of an ammonia-water falling film absorber  
Delphine Triche, French Alternative Energies and Atomic Energy Commission (CEA) French Environment and Energy Management Agency (ADEME), Le Bourget du Lac, France
- 14.30 Development of an advanced solar sorption refrigerator prototype  
Andrea Frazzica, CNR ITAE, Messina, Italy
- 14.45 Evaluation of eutectic salt mixture as thermal energy storage material for high temperature solar cooling applications  
Sergio Pintaldi, RMIT University CSIRO Energy, Mayfield West, Australia
- 15.00 Discussion

### POSTER SESSION

**Chair: Costas Balaras, Group Energy Conservation, Institute for Environmental Research & Sustainable Development, National Observatory of Athens, Greece**

- 15.20
- P0 1 Experimental study and validated model of a latent heat storage system at medium temperature for solar heating and cooling applications

David Martinez-Maradiaga, Università degli Studi di Padova, Padova, Italy

- PO 2 Experimental and theoretical investigation on a high efficient solar absorption cooling system combined with an air-source heat pump: A case study**  
Yao Zhao, Shanghai Jiao Tong University, Shanghai, China
- PO 3 Energy performances and life cycle assessment of advanced solar DEC freescoo units**  
Pietro Finocchiaro, University of Palermo, Palermo, Italy
- PO 4 System efficiency for cascading of adsorption chillers**  
Angelus Dillmann, Hochschule Kempten, Kempten, Germany
- PO 5 A novel strategy for PV based solar air conditioning**  
Alberto Coronas, Universitat Rovira i Virgili, Tarragona, Spain
- PO 6 Adapted monitoring procedure for new generation solar cooling & heating systems**  
Bettina Nocke, AEE INTEC - Institut für Nachhaltige Technologien, Gleisdorf, Austria
- PO 7 DHW/cooling hybrid strategy for solar cooling: two successful year monitoring results**  
Daniel Mugnier, Tecsol S.A., Perpignan, France
- PO 8 5 years of operating experience of a solar driven adsorption chiller/heat pump**  
Björn Nienborg, Fraunhofer ISE, Freiburg, Germany
- PO 9 First operation year of world's most powerful solar cooling operation in USA**  
Moritz Schubert, S.O.L.I.D., Graz, Austria
- PO 10 Integration of different solar cooling technologies in the cooling supply of a data center**  
Antoine Dalibard, Stuttgart University of Applied Sciences, Stuttgart, Germany
- PO 11 Climate control in the production of forest plants – using photovoltaics to power an innovative forestry incubator**  
Marco Hernandez Velasco, Dalarna University, Falun, Sweden
- PO 12 Solar cooling simulation for planning and optimization**  
Andreas Witzig, Vela Solaris AG Polysun, Winterthur, Switzerland
- PO 13 Theoretical analysis of a direct solar-regenerated liquid desiccant system augmented by a flat plate bottom reflector**  
Fernando Manuel Gómez Castro, University of Applied Sciences Stuttgart, Stuttgart, Germany
- PO 14 A simple tool for life cycle assessment of solar heating and cooling System**  
Marco Beccali, Università degli Studi di Palermo, Palermo, Italy
- PO 15 Simulation of solar air conditioning system for hot climates: such as Pakistan**  
Muhammad Asim, University of Manchester, Manchester, U.K.

**PO 16 Dynamic simulation and economic analysis of solar cooling systems in Europe**  
Valeria Palomba, CNR-ITAE, Messina, Italy

**PO 17 Storage selection and design for increased PV power self-consumption with heat pumps**  
Edo Wiemken, Fraunhofer ISE, Freiburg, Germany

**PO 18 SolarHybrid – project overview and first results**  
Hilbert Focke, ASIC - Austria Solar Innovation Center, Wels, Austria

**16.05 Coffee break and visit to the trade and poster exhibition**

## **SESSION 3: PHOTOVOLTAIC DRIVEN SOLAR AIR-CONDITIONING SYSTEMS**

**Chair: Wolfgang Streicher, Universität Innsbruck, Austria**

**16.45 Simulation, optimization and economic analysis of solar standalone reverse cycle air conditioning system for typical Australian homes mechanical engineering**

Gazinga Abdullah, University of South Australia/ Barbara Hardy Institute University of South Australia/ Barbara Hardy Institute, Adelaide, Australia

**17.00 Potential application of new emerging cooling technologies for solar air conditioning**  
Joan Carles Bruno, Universitat Rovira i Virgili, Tarragona, Spain

**17.15 Improved model of combined PV solar cooling and free cooling system**  
Andrejs Snegirjovs, HSR University of Applied Sciences, Rapperswil, Switzerland

**17.30 Analytical simulation of an inverter heat pump driven by the grid and PV panels simultaneously**  
Francisco J. Aguilar Valero, University Miguel Hernández, Elche, Spain

**17.45 Discussion**

**18.00 End of the first conference day**

**18.15 Social Hour in the Leonardo da Vinci Rome Airport Hotel**

## **Friday, September 25<sup>th</sup>, 2015**

## **SESSION 4: THERMALLY DRIVEN SOLAR AIR CONDITIONING: SYSTEM TECHNOLOGY**

**Chair: Stephen White, CSIRO Energy Technology, Newcastle, Australia**

**08.30 An experimental investigation on dehumidification system using solid desiccant coated heat exchanger with heat recovery**  
Yan Jun Dai, Shanghai Jiao Tong University, Shanghai, China

- 08.45 **New solar desiccant and evaporative Cooling unit based on fixed and cooled adsorption beds and wet heat exchangers assisted by a building integrated solar PV/T generator**  
Marco Beccali, Information Engineering and Mathematics Modeling (DEIM), Università degli Studi di Palermo, Italy
- 09.00 **Operating conditions of a NH<sub>3</sub>/H<sub>2</sub>O chiller for trigeneration systems – chiller adaption and first results**  
Werner Pink, Pink GmbH, Langenwang, Austria
- 09.15 **Applicability of a desiccant dew-point cooling system independent of external water sources**  
Lorenzo Bellemo, Technical University of Denmark, Kgs Lyngby, Denmark
- 09.30 **Hybrid Libr absorption chiller boosted by high speed turbo-compressor**  
Christian Schweigler, University of Applied Sciences Munich, Munich, Germany
- 09.45 **Discussion**
- 10.10 **Coffee break and visit to the poster exhibition**

## SESSION 5: THERMALLY DRIVEN SOLAR AIR CONDITIONING: CONTROLLING

**Chair: Hans-Martin Henning, Fraunhofer ISE, Freiburg, Germany**

- 10.50 **Optimized generic control strategies for solar thermal cooling systems**  
Björn Nienborg, Fraunhofer ISE, Freiburg, Germany
- 11.05 **Influence of fan's control strategies on heat rejection potential**  
Matteo D'Antoni, EURAC Research, Bolzano, Italy
- 11.20 **Control method for increasing efficiency over solar heating and cooling system**  
Lee Dong Kyu, Hyundai Engineering and Construction Company, Yongin, South Korea
- 11.35 **Pump efficiency and adaptability in solar cooling applications**  
Martin Helm, Bavarian Centre for Applied Energy Research (ZAE Bayern), Garching, Germany
- 11.50 **Discussion**

### 12.10 **Poster award Award Ceremony: Two Winners**

#### **Committee:**

**Costas Balaras**, Group Energy Conservation, Institute for Environmental Research & Sustainable Development, National Observatory of Athens, Greece  
**Wolfgang Streicher**, Universität Innsbruck, Austria  
**Constanze Bongs**, Fraunhofer ISE, Freiburg, Germany

- 12.20 **Lunch and visit to the poster exhibition – Meet the poster award winners**

## SESSION 6: SYSTEM DESIGN: DESIGN TOOLS, SIMULATION, ENGINEERING

**Chair: Yanjun Dai, Shanghai Jiao Tong University, Shanghai, China**

- 13.30 **A method to guarantee the performance of solar heating and cooling systems**  
Daniel Mugnier, TECSOL, Perpignan, France
- 13.45 **Solar absorption air-conditioning in Saudi Arabia: a simulation study**  
Ahmed Al-Mogbel, King Abdulaziz City for Science and Technology (KACST), Riyadh, Saudi Arabia
- 14.00 **Solar assisted trigeneration in the food logistics industry**  
Ursula Eicker, University of Applied Sciences Stuttgart, Stuttgart, Germany
- 14.15 **A solar cooling system for a data center in South Africa**  
Tobias Schwind, Industrial Solar GmbH, Freiburg, Germany
- 14.30 **Discussion**
- 14.50 **Coffee break**

## SESSION 7: PRACTICAL EXPERIENCE: OPERATION, MAINTENANCE, ENERGY PERFORMANCE, COST PERFORMANCE

**Chair: Kyriakos Tsiftes, University of Cyprus, Nikosia, Cyprus**

- 15.20 **Technical and economic assessment of SHC plants – Compilation of 10 best practice examples of IEA SHC Task 48**  
Daniel Neyer, University of Innsbruck, Innsbruck, Austria
- 15.35 **First performance results of solar cooling in Jordan based on highly efficient absorption chillers**  
Christopher Paitazoglou, Technische Universität Berlin, Berlin, Germany
- 15.50 **High efficiency mirrorless solar thermal as economically viable solar air cooling driver**  
Jonathan Koifman, TVP Solar, Meyrin, Switzerland
- 16.05 **Discussion**
- 16.20 **Closing remarks**  
**Conference Chairwoman Ursula Eicker**, University of Applied Sciences Stuttgart, Germany
- 16.30 **End of the Conference**



- Planners, architects, engineers and scientists active in air-conditioning, solar thermal and cooling
- energy policy makers
- manufacturers
- industry representatives
- other attendees

## Organisation Committee

**Bernd Porzelius**  
**Gabriele Struthoff-Müller**

OTTI e.V.  
Renewable Energies  
Wernerwerkstraße 4  
93049 Regensburg  
Germany

Phone: +49 941 29688-29, Fax: +49 941 29688-17  
E-Mail: [gabriele.struthoff-mueller@otti.de](mailto:gabriele.struthoff-mueller@otti.de)  
[www.otti.eu](http://www.otti.eu), [www.solaircon.com](http://www.solaircon.com)

## Travel Information

More information you will find under  
[www.solaircon.com/info/conference-venue-accommodation.html](http://www.solaircon.com/info/conference-venue-accommodation.html)

## Accommodation

### Conference Venue

#### Leonardo da Vinci Rome Airport Hotel

Via Portunese, 247000054 Fiumicino/Rome, Italy

[www.romeairporthotel.it](http://www.romeairporthotel.it)  
[info@romeairporthotel.it](mailto:info@romeairporthotel.it)

The Leonardo da Vinci Rome Airport Hotel has an OPTION for participants until June 30<sup>th</sup>, 2015. Reference code is OTTI. Hotel rate: 100 Euro per day and person (incl. breakfast)

## Information about OTTI

OTTI (Ostbayerisches Technologie-Transfer Institut e.V.) was founded in 1977 as a non-profit-organisation. Our main goals are to provide state-of-the-art information and to establish networks between people from industry, science, and administration by providing conferences and workshops. Over the years we have expanded our offers, now reaching from specific technology areas like material sciences to management training. Our energy department is one of the leading European organisers of international conferences and seminars in the field of renewable energies. The goal is to provide events where our international participants from science and industry can share their knowledge and experience, and present new technologies designed to increase the efficient use of renewable energies. We work closely together with our scientific committee representing experts from industry and research from all over the world. Our highly motivated and experienced team is always looking for new topics to provide interesting conferences on visionary topics. The topics of our conferences comprise mini-grids, smart grids and mobility, photovoltaics, solar thermal energy, solar air-conditioning and biomass energy. Furthermore, we offer courses in the fields of building, construction and the efficient use of energy. Besides lectures and workshops OTTI offers accompanying trade exhibitions or technical tours. It is very important for us to create an atmosphere in which our participants can meet and share their knowledge and experience. Therefore, we offer long breaks and common meals to get into contact with other people. Do you have any questions? Our team is always willing to help you.

Please find all relevant contact information on [www.otti.eu](http://www.otti.eu). There you can also find more details about our conferences.

For more detailed information please visit [www.otti.eu](http://www.otti.eu)

# Registration Conditions

You will receive your registration documents with receipt of your registration. The participation fee is VAT-exempt and due net with receipt of the invoice. Please transfer the invoice amount not later than 14 days before the conference starts. Otherwise a copy of the transfer order must be presented at the conference desk. All bank charges have to be covered by the transmitter. Entrance to the conference can only be permitted if OTTI has received the payment. OTTI reserves the right to make modification and amendments of any kind for urgent reasons.

In the case of a cancellation of your registration up to 30 days before the seminar takes place, we do not raise a cancellation fee. For cancellations made within a period of 30 to 15 days before the start of the seminar, we charge a service fee of € 120. In the event of cancellations made later than 15 days before the seminar, or in the case of absenteeism, the total participation fee will be charged, unless you are able to provide evidence of a deviating amount of damages or expenses.

The cancellation must be in written form. The person representing the contracting party may be replaced at any time but a written notice is necessary not later than 4 days before the conference starts. Irrespective of legal basis, OTTI shall only be liable for property damage and pecuniary loss which occurred due to intent or gross negligence. The place of fulfilment and jurisdiction is Regensburg, Germany.

## Registration

### If registered until August 10<sup>th</sup>, 2015

Per Person: . . . . . € 740,00  
Member of OTTI and supporting organisations: . . . . . € 640,00

### If registered after August 10<sup>th</sup>, 2015

Per Person: . . . . . € 780,00  
Member of OTTI and supporting organisations: . . . . . € 720,00

Fees cover the admission to all sessions, invitation to all coffee breaks, conference lunches, the social hour and the conference proceedings.

Workshop **The New Generation Solar Cooling & Heating Systems** (PV or solar thermally driven systems) / IEA SHC Task 53 is free of charge for participants of the conference, but they have to register.

**Only online registration available.**  
**To register for the conference please visit:**  
**[www.otti.eu/registration/SAC-4880](http://www.otti.eu/registration/SAC-4880)**

**The conference language is English.**