

Programme

3rd International Conference Solar Air-Conditioning

September 30th, 2009 – October 2nd, 2009
Palermo, Sicily, Italy

Wednesday, September 30th, 2009

13:30 **Opening Address**

Roberto Lagalla, Rector, Università degli Studi di Palermo, Italy

Eckardt Günther, OTTI, Regensburg, Germany

Angelo Milone, Chairman of the Faculty, Università degli Studi di Palermo, Italy

Marco Beccali, DREAM, Università degli Studi di Palermo, Italy

Opening Session:

Political - Economical Framework

Chair: Marco Beccali, DREAM, Università degli Studi di Palermo, Italy

- 13:50 Removal of Non-Technological Barriers to Solar Cooling Technology across Southern European Islands
Stefano Rugginenti, APEA, Agrigento, Italy
- 14:05 The Added Economic and Environmental Value of Solar Thermal Systems in Microgrids with Combined Heat and Power
Chris Marnay, Lawrence Berkeley National Laboratory, Berkeley, United States of America
- 14:20 Australian Solar Cooling Interest Group
Paul Kohlenbach, Solem Consulting, Australia
- 14:35 Designing of a Technology- Roadmap for Solar Assisted Air Conditioning in Austria
Hilbert Focke, ASIC - Austria Solar Innovation Center, Wels, Austria
- 14:50 Solar Cooling in the New Context of Renewable Policies at European Level
Raffaele Piria, Vice President ESTIF, Brussels, Belgium

15:00 **Discussion**

15:10 **Coffee Break and Visit of the Trade and Poster Exhibition**

System Technology

Chair: Wolfgang Streicher, Technische Universität Graz; Institut für Wärmetechnik, Graz, Austria

15:45 Prototype of a Solar Driven Steam Jet Ejector Chiller
Clemens Pollerberg, Fraunhofer-Institut für Umwelt, Sicherheits- und Energietechnik UMSICHT, Oberhausen, Germany

16:00 New integrated Solar Air Conditioning System
Joan Carlos Bruno, CREVER-Universitat Rovira i Virgili, Tarragona, Spain

16:15 Primary Energy Optimised Operation of Solar Driven Desiccant Evaporative Cooling Systems through Innovative control Strategies
Dirk Pietruschka, Fachhochschule Stuttgart, Stuttgart, Germany

16:30 **Discussion**

16:45 **Short Break**

Poster Session

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

17:00 **System Design: Design Tools, Simulation, Engineering**

A1 Control Strategies Study of a complete Solar Assisted Air Conditioning System in an Office Building using TRNSYS.
Sébastien Thomas, University of Liège, Arlon, Belgium

A2 Thermally Driven Adsorption Chillers: Simulation of a Solar Cooling System for Buildings
Max Werlein, Valencia, Spain

A3 Simulation of a small size Adsorption Air Conditioning System driven by Solar Energy.
Andrea Frazzica, CNR-ITAE, Messina, Italy

A4 Development of a Model for the Simulation of an Absorption Chiller Air – Cooled “Rotartica” by TRNYS.
Luis A. Bujedo, Centro Tecnológico CARTIF, Boecillo, Valladolid, Spain

A5 Theoretical Study of Monomethylamine-Water Solutions in a Solar Absorption Refrigerator for Food Conservation
Cesar Isaza, Universidad Pontificia Bolivariana, Medellin, Columbia

- A6 Feasibility of Integration of Solar Cooling Systems in existing Buildings: Technical and Economical Results
Isabelle Verdier, Veolia Environnement Energy Research Center, Limay, France
- A7 Primary Energy Analysis of a Solar Cooling Plant connected to a District Heating and Cooling Network
Jesús López-Villada, CREVER-Universitat Rovira i Virgili, Tarragona, Spain
- A8 Comparison of different Solar Assisted Energy System for a large scale Office Building
Wolfram Sparber, EURAC, Bolzano, Italy
- A9 Effects of Desiccant Wheel Revolution Speed Control on Performances of Solar Desiccant Cooling Systems
Stefano De Antonellis, Politecnico di Milano, Milano, Italy
- A10 Simulation Software for Solar Absorption Air Conditioning Systems
Pilar Monsalvete, AICIA, Seville, Spain
- A11 SDHW Storage Layouts and its Control Strategies depending on the Combination with different Heating Devices, Sorption Chillers and Heat Pumps
Patrizia Melograno, EURAC Research, Bolzano, Italy
- A12 Assessment of Standard Small-Scale Solar Cooling Configurations within the SolarCombi+ Project
Roberto Fedrizzi, EURAC Research, Bolzano, Italy
- A13 Solar Combi+ System with a 4,5 kW Absorption Chiller: Best Choice for different Cases
Francesco Besana, Eurac research Università degli studi di Bergamo, Bozen, Italy
- A14 Cancelled
- A15 Cancelled
- A16 Desiccant Cooling Simulation and Design in Matlab/Simulink Environment: Implementation and Validation of the Model
Marco Beccali, DREAM, Università degli Studi di Palermo, Palermo, Italy
- A17 Thermal Performance of Liquid Desiccant Solar Air Conditioning in Hot / Humid Climatic Region of South East Asia
Edward Halawa, University of South Australia, Adelaide, Australia

Components: Heat Driven Water Chillers, Heat Driven Open Cycles

- B1 Cancelled

- B2 Design and Operation of a new Adsorption Chiller Prototype driven by low grade Thermal Energy
Angelo Freni, CNR-ITAE, Messina, Italy
- B3 Desiccant Wheels Models: Investigation on the fully developed Temperature and Velocity Profile Assumption
Stefano De Antonellis, Politecnico di Milano, Milano, Italy
- B4 Experimental evaluation of a sorptive-coated Heat Exchanger Prototype for Dehumidification Purposes
Alexander Morgenstern, Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg, Germany
- B5 Boost in Power Density of Adsorbers by zeolite coated Metal Fibres
Gerrit Földner, Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg, Germany
- B6 Development of a new 2.5 kW Adsorption Chiller for heat driven Cooling
Ernst-Jan Bakker, Energy Research Centre of the Netherlands, Petten, The Netherlands
- B7 Solar Cooling in Residential, Small Scale Commercial and Industrial Applications with Adsorption Technology
Walter Mittelbach, SorTech AG, Halle (Saale), Germany
- B8 Development of a 5 kW Absorption Chiller for Solar Cooling Installations
Mathias Safarik, Institut für Luft- u. Kältetechnik Gemeinnützige Gesellschaft mbH, Dresden, Germany
- B9 Feasibility of air-cooled Solar Air-Conditioning in hot arid Climate Regions
Zouhour Sayadi, University of Monastir, Monastir, Tunisia
- B10 Performance optimization of a water-cooled single-effect LiBr/water Low Power Absorption Machine
José Daniel Marcos, UNED, Madrid, Spain
- B11 Feasibility Study of alternative Absorption Heat Pump Processes
Oleksandr Kotenko, Technical University of Graz, Graz, Austria
- B12 Thermally Driven metal hydride Cooling Systems: Experimental and Numerical Results of a 400W Cooling System
Jorge Paya, Valencia, Spain
- B13 Cancelled
- B14 Comparison of Silica Gel and Zeolite Desiccant Wheel Performance
Stephen White, CSIRO, Newcastle, NSW, Australia
- B15 Experimental Evaluation of Heat Transfer in a Horizontal Tube Falling Film Generator of $\text{NH}_3\text{-LiNO}_3$ Absorption Cooling System
José Vidal Herrera, Centro de Investigación en Energía Universidad Nacional Autónoma de México, Temixco, Morelos, Mexico

B16 Static Analysis of a Solar Powered Liquid Absorption Chiller
Jean Castaing-Lasvignottes, Laboratoire de Thermique, Energétique et Procédés, Pau, France

18:00 **Drinks and Visit of the Trade and Poster Exhibition**

19:00 **End of the First Conference Day**

Thursday, October 1st, 2009

Industry Forum

Chair: Christian Schweigler, ZAE Bayern – Bayer. Zentrum für Angewandte Energieforschung e.V., Garching, Germany

09:00 Green Chiller Association
Uli Jakob, Berlin, Germany

09:10 ClimateWell®
Olof Hallström, Climatewell, Stockholm, Sweden

09:20 Low Capacity Absorption Chillers for Solar Cooling Applications
Gregor Weidner, EAW Energieanlagenbau GmbH, Westenfeld, Germany

09:30 Solar Cooling in Residential, Small Scale Commercial and Industrial Applications with Adsorption Technology
Walter Mittelbach, SorTech AG, Halle (Saale), Germany

09:40 French Solar Heating and Cooling Development Programme based on Energy Performance
Daniel Mugnier, Sun Power Systems, Perpignan, France

09:50 Mirrox Fresnel Process Heat Collectors for Industrial Applications and Solar Cooling
Christian Zahler, Mirrox GmbH, Freiburg, Germany

10:00 Modelling and Analyzing Solar Cooling Systems in Polysun
Seyed Hossein Rezaei, Velasolaris AG, Switzerland

10:10 Solar Cooling Application in Valle Susa Italy
Sufia Jung, OLYMP ITALIA SRL, Bruino TO, Italy

10:20 **Coffee Break and Visit of the Trade and Poster Exhibition**

System Design: Design Tools, Simulation, Engineering

Chair: Daniel Mugnier, TECSOL S.A., Perpignan, France

11:00 Virtual Case Study on small Solar Cooling Systems within the SolarCombi+ Project
Bjoern Nienborg, Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg, Germany

- 11:15 Design of Solar Cooling Plants under Uncertainty
Fernando Domínguez-Muñoz, University of Malaga, Malaga, Spain
- 11:30 Fast Pre-Design of Systems using Solar Thermally Driven Chillers
Hans-Martin Henning, Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg, Germany
- 11:45 Design of a high fraction Solar Heating and Cooling plant in southern European country
Ignasi Gurruchaga, AIGUASOL Engineering, Barcelona, Spain
- 12:00 Optimisation Potential of a large Solar Adsorption Cooling Plant
Antoine Dalibard, zafh.net Hochschule für Technik Stuttgart, Stuttgart, Germany
- 12:15 Planning, Commissioning and Practical Experience with first Summer of Operation of a cost effective Solar Air Conditioning System for a Canteen at Munich Airport
Carsten Hindenburg, Hindenburg Consulting, Anwil, Switzerland
- 12:30 **Discussion**
- 13:00 **Lunch and Visit of Trade and Poster Exhibition**

Practical Experience: Operation Maintenance, Energy Performance, Cost Performance Part 1

Chair: Wolfgang Streicher, Technische Universität Graz, Institut für Wärmetechnik Graz, Austria

- 14:15 Energy and Economic Performance of Solar Cooling Systems
Ursula Eicker, Fachhochschule Stuttgart Hochschule für Technik, Stuttgart, Germany
- 14:30 Solar-driven Adsorption Chiller Controlled by Hot and Cooling Water Temperature
Jan Albers, TU Berlin, Berlin, Germany
- 14:45 Comparative Results of monitored Solar Assisted Heating and Cooling Installations
Wolfram Sparber, EURAC, Bolzano, Italy
- 15:00 Heating and Cooling with a small Scale Solar Driven Adsorption Chiller combined with a combined with a Borehole System – Recent Results
Tomas Núñez, Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg, Germany
- 15:15 **Discussion**
- 15:40 **Coffee Break and Visit of the Trade and Poster Exhibition**

Practical Experience: Operation Maintenance, Energy Performance, Cost Performance Part 2

Chair: Ursula Eicker, Fachhochschule Stuttgart, Hochschule für Technik Stuttgart, Germany

- 16:20 Solar Heating and Cooling – Town Hall Gleisdorf
Alexander Thür, AEE INTEC, Gleisdorf, Austria
- 16:35 Solar Desiccant Cooling System operating in Palermo (Italy): Results and Validation of Simulation Models
Marco Beccali, Università degli Studi di Palermo, Palermo, Italy
- 16:50 **Discussion**

Poster Session

Chair: Ursula Eicker, Fachhochschule Stuttgart, Hochschule für Technik Stuttgart, Germany

17:00 System Technology

- C1 Performance of a Solar Heating and Cooling System with Absorption Chiller and Latent Heat Storage
Martin Helm, ZAE Bayern - Bayer. Zentrum für Angewandte Energieforschung e.V., Garching, Germany
- C2 Vacuum ice Storage as a Novel Concept of Energy Storage in Solar Cooling Systems
Mathias Safarik, Institut für Luft- u. Kältetechnik Gemeinnützige Gesellschaft mbH, Dresden
- C3 Experimental Analysis of a Discontinuous Sorption Chiller Operated in Steady Conditions
Patrizia Melograno, EURAC Research, Bolzano, Italy
- C4 RefleC – A new Collector for Solar Cooling Applications with Operating Temperatures up to 150 °C.
Stefan Heß, Fraunhofer Institut für Solare Energiesysteme ISE, Freiburg (Brsg.), Germany
- C5 The Application of a novel Solar Refrigeration Concept in the Food and Agro Industry: System's Concept and Optimization
Osama Ayadi, Politecnico di Milano, Milano, Italy
- C6 First Demonstration of Solar & District Heat Driven Adsorption Heat Pump in Combination with Underground Thermal Energy Storage in Denmark
Reto Michael Hummelshøj, COWI A/S, Kongens Lyngby, Denmark

- C7 Feasibility of air-cooled Solar Air-Conditioning in hot arid Climate Regions
Ahmed Bellagi, University of Monastir, Monastir, Tunisia
- C8 Optimisation of Geometrical Parameters of a solar integrated Bubble Pump in the Flat Plate Collector
Bécher Chaouachi, Ecole Nationale d'ingénieurs de GABES, Tunisia
- C9 Influence of the Solar Diffusion-Absorption Machines Configuration on its Performance
Slimane Gabsi, Institut Supérieur de Biotechnologie Ecole Nationale d'Ingénieurs GABES, SFAX, Tunisia

Solar Cooling Applications

- D1 An Experimental Solar Cooling System with a small size Absorption Chiller: Design and first Measurements.
Francesco Asdrubali, Università degli Studi di Perugia, Perugia, Italy
- D2 Initial Experiments of a Novel Liquid Desiccant Dehumidifier for Industrial and Comfort Air Conditioning Systems
Mustafa Jaradat, Kassel University, Kassel, Germany
- D3 Climatic Constraints for solar-assisted Desiccant Systems in hot - humid Climates
Gianpiero Evola, University of Catania, Catania, Italy
- D4 Applications of Solar cooling Technologies in Buildings in Latvia (North-Eastern Europe) Climate Conditions. Feasibility and Attractiveness.
Dzintars Jaunzems, Riga Technical university, Riga, Latvia
- D5 Energy Performance of a Simple Effect Absorption Chiller with Cold Storage in PCM supplied by Solar Collectors
Roberto Bruno, University of Calabria, Arcavacata di Rende (CS), Italy
- D6 Design of the Lay-Out of a PTC Solar Field for a SHC Plant at the Misericordia of Badia a Ripoli: A Method for the Optimization of the Energy Collection
Davide Fissi, Department of Energy Engineering "S.Stecco", Sapienza University of Florence, Florence, Italy
- D7 Solar Cooling Opportunities on Fruit and Dairy Farms
Sonja Ott, Sustainability Victoria, Melbourne , Australia
- D8 Solar Cooling: Study on the Technical-Economic Feasibility of a Plant in a Hotel
Angelo Milone, DREAM, Università degli Studi di Palermo, Italy

17:35 **Practical Experience**

- E1 Small-scale One Stage LiBr-H₂O Absorption Chiller with Identical Design of Desorber and Absorber
Jiri Pospisil, Brno University of Technology, Brno, Czech Republic

- E2 Solar Air-Conditioning in the German Solarthermie 2000plus Programme:
Installed Plants and first Monitoring Results
Edo Wiemken, Fraunhofer-Institut für Solare Energiesysteme ISE,
Freiburg, Germany
- E3 Field Report of a solar assisted Air Conditioning System in an Office
Building located in Upper Austria
Hilbert Focke, ASIC - Austria Solar Innovation Center, Wels, Austria
- E4 Demonstration and Field Test of a Solar Air Condition System with an
Absorption Chiller/Heater operated with Solar Thermal Energy and/or
Fuel Gas for Commercial Buildings
Naoki Onda, Tokyo Gas Co., Ltd, Tokyo, Japan
- E5 Solar Absorption Cooling Plant in Seville
Pablo Bermejo, Seville, Spain
- E6 In-Situ Measurements, Simulation and System Optimisation of a Solar-
Driven DEC-System in an Industrial Environment
Christoph Trinkl, Hochschule Ingolstadt, Ingolstadt, Germany
- E7 Experience Report on two different solar driven Air-Conditioning Systems
in Vienna/ Austria based on Monitoring Data of Summer 2008/2009
Anita Preisler, arsenal research GmbH, Vienna, Austria
- E8 Design and Setup of a small Solar Combi + Demonstration Plant in a
Passive House
Francesco Besana, Eurac research Università degli studi di Bergamo,
Bozen, Italy
- E9 Results of DEC Unit Assisted by Solar Energy in Lisbon
João Farinha Mendes, LNEG – Laboratório Nacional de Energia e
Geologia, Lisbon, Portugal
- E10 Large-Scale Solar Cooling Plants in America, Asia and Europe
Christian Holter, S.O.L.I.D. GmbH, Graz, Austria

20:30 **Dinner in the Grand Hotel et des Palmes**

Friday, October 2nd, 2009

Components: Heat Driven Water Chillers, Heat Driven Open Cycles

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

- 09:00 The Application of a Liquid-Desiccant Air Conditioner to Solar Cooling
Andrew Lowenstein, AIL Research, Princeton, United States of America
- 09:15 A compact solid Adsorption Chiller for Solar Air Conditioning
Robert Critoph, University of Warwick, Coventry, United Kingdom

- 09:30 Development of a Two-Stage Absorption Chiller for Solar-Assisted Cooling and Heating
Manuel Riepl, ZAE Bayern - Bayer. Zentrum für Angewandte Energieforschung e.V., Garching, Germany
- 09:45 Ionic liquids – a promising Solution for Solar Absorption Chillers?
Annett Kühn, Technische Universität Berlin, Berlin, Germany
- 10:00 Parabolic Trough Design Optimization for high Temperature Lift Solar Cooling Applications
Marcello Aprile, Politecnico di Milano, Milano, Italy
- 10:15 Tentative R&D Program for getting Adsorbents effective for Solar Air Conditioning
Yury Aristov, Novosibirsk, Russia
- 10:30 **Discussion**
- 11:00 **Coffee Break and Visit of the Trade and Poster Exhibition**

Solar Cooling Applications

Chair: Alberto Coronas, CREVER-Universitat Rovira i Virgili, Tarragona, Spain

- 11:30 An Energy Efficient Solar Driven Two-Stage Rotary Desiccant Cooling System: Experiment and Case Study
Yanjun Dai, Shanghai Jiao Tong University, Shanghai, China
- 11:45 Performance of a flat Plate Collector-Regenerator that uses Earth-to-Air Heat Exchangers for Regeneration of Water-Lithium Chloride Solution in a Solar Cooling Plant
Roberto Bruno, University of Calabria, Arcavacata di Rende (CS), Italy
- 12:00 350 KW of Dual Solar Cooling for optimal Flexibility and Economic Performance
Roel De Coninck, 3E, Brussels, Belgium
- 12:15 Global Performance of a Solar Absorption Cooling Plant coupled with a conventional Vapour Compression Refrigeration System
Pilar Monsalvete, *AICIA*, Seville, Spain
- 12:30 Theoretical and Experimental Evaluation of an Intermittent Solar Absorption Refrigeration System for Ice Production.
Wilfrido Rivera, Universidad Nacional Autónoma de México, Temixco, México
- 12:45 Solar cooling with an ICE-Storage Back-Up System
Marco Zetsche, Universität Stuttgart - Institut f. Thermodynamik u. Wärmetechnik, Stuttgart, Germany
- 13:00 **Discussion**

13:30 **Poster Award Ceremony – 3 Winners**

Award Committee:

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

Ursula Eicker, Fachhochschule Stuttgart, Hochschule für Technik Stuttgart, Germany

Alberto Coronas, CREVER-Universitat Rovira i Virgili, Tarragona, Spain

13:40 Closing Remarks

Marco Beccali, DREAM, Univerità degli Studi di Palermo, Italy

13:45 **End of the Conference**