8th International Energy Agency

PROGRAM

HEAT PUMP CONFERENCE 2005

Global Advances in Heat Pump Technology, Applications, and Markets

CAESARS PALACE

Las Vegas, Nevada, USA

May 30 – June 2, 2005

IEA HP 2005

2nd Announcement

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Global Advances in Heat Pump Technology, Applications, and Markets

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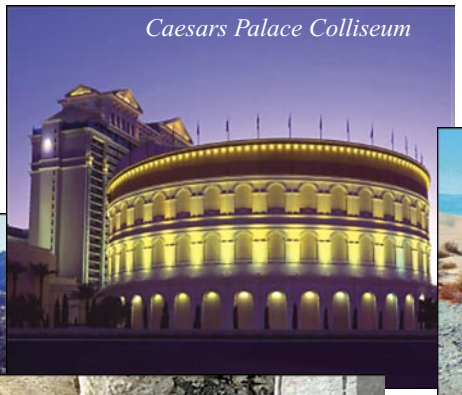

Caesars Palace Colliseum

Death Valley, California

Photo: André Winter

Yosemite National Park, California

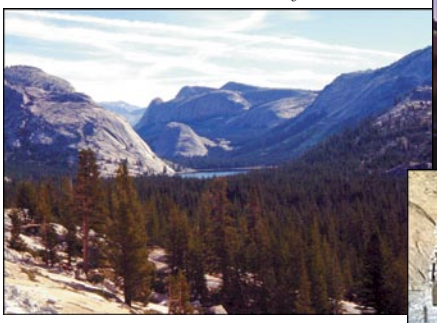

Photo: André Winter

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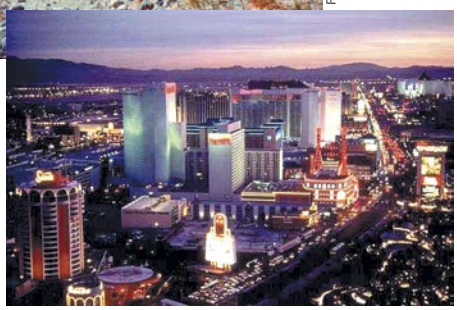
Mesa Verde National Park, Utah and Arizona

Las Vegas, Nevada



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Acknowledgements

The success of this conference would not be possible without the financial support of our sponsors. The International Organizing Committee (IOC) and the National Organizing Committee (NOC) would like to thank the following for their generous contributions.

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Organizational Sponsors:

ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
GHPC	Geothermal Heat Pump Consortium
IIR	International Institute of Refrigeration
IGSHPA	International Ground Source Heat Pump Association

Organization

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Mr. Arun Vohra	U.S. Department of Energy

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Conference Internet Site

http://www.ornl.gov/hp2005

General Information

The IEA International Heat Pump Conference will be held in Las Vegas, Nevada, May 30 to June 2, 2005. This conference is the 8th in a series of triennial conferences under the auspices of the International Energy Agency (IEA) Heat Pumping Technologies Programme (HPP), which deals with heat pumps, air conditioning, and related refrigeration technologies. This conference will summarize advances and trends in global markets, applications, and technology developments. Previous conferences were held in Beijing (2002), Berlin (1999), Toronto (1996), Maastricht (1993), Tokyo (1990), Orlando (1987), and Graz (1984).

Conference Venue and Hotel

The conference will be held May 30 to June 2, 2005, at Caesars Palace. The conference room rate is 159 USD per night. In order to guarantee this rate, reservations must be made by May 2, 2005. This special rate will be offered May 24 to June 10. To book your reservation online, go to *http://www.ornl.gov/hp2005* and click on "hotel." Conference attendees and spouses who are registered at Caesars Palace hotel will be entitled to free breakfasts in the Terrazza Restaurant for the duration of the conference (May 30 to June 2).

Objectives of the Conference

The conference aims to promote worldwide implementation and improvement of pumping technologies via exchanges, and discussion of technical, market, policy, and standards information with consideration for the environmental and energy-conserving benefits of these technologies.

International Flights

McCarran International Airport is a short drive from Caesars Palace. The airport services many U.S. and international airlines (see *www.mccarran.com/airlines.asp*) providing convenient access for conference attendees.

Language

All presentations and discussions will be in English.

Visas

International visitors should determine from their local government if a visa will be required to enter the U.S. Please notify the conference secretariat if prospective attendees require a letter of invitation to attend the conference.

Exhibition

The conference will feature an exhibition of displays by national teams, R&D organizations, manufacturers, associations, and societies. Conference participants will be encouraged to visit the exhibition from Tuesday, May 31 to Thursday, June 2. For more details, please refer to Exhibition at *www.ornl.gov/hp2005*. Please contact the conference secretariat if your organization is interested in reserving exhibition space. The cost is 1200 USD for each 10 ft x 10 ft exhibition space, including a table and drapery, if needed.

Spouse Program

Las Vegas offers many unique and creative opportunities for spouses to explore the city, uncover Vegas mysteries, and make new acquaintances. The conference organizers have prepared half-day tours including a museum and shopping excursion.

Workshops

There will be two workshops offered on Monday, May 30: (1) Test Procedures & Seasonal Performance Calculation Methods; and (2) Ground Source Heat Pumps. See Registration Form (page 17) to sign up.

Conference Registration

Full-Time Conference	700 USD (775 USD after April 29, 2005)
Student	200 USD (250 USD after April 29, 2005)
Spouse	200 USD (250 USD after April 29, 2005)
Optional Show Ticket	77 USD for Blue Man Group show at Luxor Hotel
Technical Tours	Option 1: Lake Las Vegas / Option 2: Rocky Research (included in registration fee)

Conference Schedule

Date	Time	Event	
Monday, May 30, 2005	08:30-12:30	WORKSHOP 1 Test Procedures and Seasonal Performance Calculation Methods	
	13:30-17:30	REGISTRATION	WORKSHOP 2 Ground Source Heat Pumps – Overcoming Market & Technical Barriers
	18:00-20:00	WELCOME RECEPTION	
Tuesday May 31, 2005	09:00-12:15	OPENING PLENARY Welcoming Addresses, Regional Reports, and Opening of Poster Sessions	
	12:30-13:30	LUNCH	
	13:30-18:00	SESSION 2 Energy and Environment	SESSION 3 Heat Pump Applications
Wednesday June 1, 2005	08:00-12:20	SESSION 4 Ground- and Water-Source Heat Pump Systems (Design and Application Tools)	SESSION 5 Integration of Heat Pumps in Cooling, Heating, and Power (CHP) Systems
	12:30-13:30	LUNCH	
	13:30-18:00	TECHNICAL TOURS	
	19:00-23:00	CONFERENCE BANQUET	
Thursday June 2, 2005	08:00-12:20	SESSION 6 Advanced Concepts – Components	SESSION 7 Advanced Systems and Equipment
	12:30-13:30	LUNCH	
	13:30-17:00	SESSION 8 Experiences With Alternate Refrigerants	SESSION 9 Country Research Program Overviews
	17:00-17:30	SUMMARY & CLOSING SESSION Dr. Peter Rohlin, IOC Chairman Mr. John Ryan, U.S. DOE	

Conference Program

Please note: This program is preliminary and subject to changes.

Monday, May 30, 2005

08:30 – 12:30	**Workshop 1** – Test Procedures & Seasonal Performance Calculation Methods for Residential Heat Pumps with Combined Space and Domestic Hot Water Heating (IEA HPP Annex 28)
13:30 – 17:30	**Registration** - 3rd Floor Conference Desk
13:30 – 17:30	**Workshop 2** – Ground Source Heat Pumps – Overcoming Market and Technical Barriers (IEA HPP Annex 29)
18:00 – 20:00	**Welcome Reception** - Emperor's Ballroom

Tuesday, May 31, 2005

08:00 – 09:00	**Registration** – 3rd Floor Conference Desk	
09:00 – 12:15	**Session 1: Opening Plenary Session** Chairperson: Mr. John Ryan, U.S. Department of Energy	
09:00 – 09:15	Welcoming Address by U.S. Government Official	
09:15 – 09:45	Opening Address on Behalf of the International Energy Agency	
09:45 – 10:00	Conference Theme Comments and Keynote Address	
10:30 – 10:45	Conference Remarks – John Ryan	
10:45 – 11:15	Coffee Break	
11:15 – 12:30	**Regional Reports:** "Heat Pumps – Status and Trends"	
11:15 – 11:35	a) North America – Mark Menzer, Air Conditioning and Refrigeration Institute	
11:35 – 11:55	b) Europe – Dr. Monica Axell, IEA Heat Pump Centre	
11:55 – 12:15	c) Asia/Pacific – T. Yoshii (Heat Pump Technology Center of Japan) and Wei Xu (China Academy of Building Research)	
12:15 – 13:30	Lunch	
13:30 – 18:00	**Session 2: Energy and Environment** Chairperson: Dr. Sophie Hosatte, Natural Resources Canada	**Session 3: Heat Pump Applications** Chairperson: Dr. Peter Rohlin, Swedish Energy Agency
13:30 – 14:00	Keynote: Heat Pumps and the Environment – Prof. H. Halozan, Pres. IIR Comm. E2	Keynote: Heat Pumps – Who Uses Them and Why? – G. Groff, Head IIR Sect. E, V.P. IIR Science & Technology Council
14:00 – 14:25	Market Transformation in Canada - The Roles of the Environment & Energy Efficiency – Ann Kelly	Increasing Consumer Confidence in Heat Pumps – Nance Lovvorn
14:25 – 14:50	CO_2 Emission Reduction with GSHPs in the Eastern U.S. – A. Gitchell & L. Stiles	Unprecedented Heat Pump Market Development in Norway: What Happened/Will It Last? – R. Aarlien, et al.
14:50 – 15:15	Present Status & Future View of CO_2 Refrigerant Heat Pump Water Heater for Residential Use – M. Kusakari	Successful Application of Heat Pumps to a DHC System in the Tokyo Bay Area – A. Okagaki
15:15 – 15:30	Coffee Break	Coffee Break

(cont. next page)

Conference Program (cont.)

Tuesday, May 31, 2005 (cont.)

15:55 – 16:20	TEWI Analysis of High Temperature Residential Heat Pumps – D. Clodic & C. Rahhal	Performance Audits of Heat Pumps — Procedures and Uncertainties – P. Fahlén
16:20 – 16:45	Supermarket Refrigeration Systems Climate Change Impact – D. Bivens & P. Lundquist	Heat Pumps in Switzerland — A Story of Success – S. Peterhans & F. Rognon
16:45 – 17:00	Summary of Poster Session 2	Summary of Poster Session 3
17:00 – 18:00	**Poster Session 2**	**Poster Session 3**
18:00	Close of first day sessions - Attendees have free evening	

Wednesday, June 1, 2005

08:00 – 12:20	**Session 4: Ground- & Water-Source Heat Pump Systems (Design & Application Tools)** Chairperson: Prof. H. Halozan, Tech. Univ. Graz	**Session 5: Integration of Heat Pumps in Cooling, Heating, and Power (CHP) Systems** Chairperson: Ron Fiskum, U.S. Dept. of Energy
08:00 – 08:30	Keynote: GSHPs – Meeting Global Challenges Through Load Networking – Dr. Jim Bose, Oklahoma State Univ.	Keynote: Heat Pumping Using Combined Heat & Power (CHP) Technology – Bob DeVault, Oak Ridge National Laboratory
08:30 – 08:55	Optimization of Residential GSHP Systems - M. Kahn & J. Spitler	Performance of a Combined Power & Desiccant Cooling Demonstration – J. Ward, et al.
08:55 – 09:20	A Joint East-West Procedure for Cost-Estimating GSHP Systems – W. Fleming, X. Li, & Y. Li	On the Future Role of Heat Pumps in Swedish District Heating Systems – Competition with Combined Heat & Power Under Greenhouse Gas Emission Restrictions – M. Eriksson & L. Vamling
09:20 – 09:45	Design Tool for Ground Loop Heat Exchangers in Spain – J.F. Urchueguîa, et al.	R&D of Small Capacity Absorption Chiller Using Heat From Distributed Power Generation – E. Hihara, et al.
09:45 – 10:15	Coffee Break	Coffee Break
10:15 – 10:40	Development of a Design & Performance Prediction Tool for GSHP System – K. Nagano, et al.	Integration of an Absorption Chiller System in a Supermarket Heating, Cooling, & Power System – T. Wagner and T. Rosjford
10:40 – 11:05	A Novel Design Tool for Heat Pump Systems – P. Lundquist and M. Forsén	Concentrating Solar Thermal Absorption Chiller Heater – Z. Yue
11:05 – 11:20	Summary of Poster Session 4	Summary of Poster Session 5
11:20 – 12:20	**Poster Session 4**	**Poster Session 5**
12:30 – 13:30	Lunch	Lunch
13:30 – 18:00	**Technical Tours**	**Technical Tours**
19:00 – 23:00	**Reception and Conference Banquet** - Emperor's Ballroom	

Thursday, June 2, 2005

08:00 – 12:20	**Session 6: Adv. Concepts — Components** Chairperson: Prof. Thomas Kopp, Switzerland	**Session 7: Advanced Systems & Equipment** Chairperson: Ms. Trude Tokle, Enova, Norway
08:00 – 08:30	Keynote: Innovative Components for Advanced Systems – Prof. Clark Bullard, Univ. of Illinois; Pres. IIR B2	Keynote: Challenges in Heat Pumping Technologies – Prof. Eric Granryd, Pres., IIR General Assembly

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Conference Program (cont.)

Thursday, June 2, 2005 (cont.)

08:30 – 08:55	Demonstration of the Potential of Use of Micro-Channel Heat-Exchangers in a Reversible Heat Pump – D. Hantz	Development of High Performance Centrifugal Chiller – Y. Shirakata, et al.
08:55 – 09:20	Split-System Residential Heat Pump with Separate Dehumidification Operating Mode – R. Uselton & O. Hansen	The Exhaust Air Heat Pump — A Rational Way of Heating Low Energy Houses – M. Fehrm
09:20 – 09:45	The Influence of Product Design and Evaporator Air Flow on Sensible Heat Ratio – W. Reedy & C. Bullock	Development & Measurement of Compact Heating & Ventilating Units with Integrated Exhaust Air Heat Pump for High Performance Houses – A. Bühring
09:45 – 10:15	Coffee Break	Coffee Break
10:15 – 10:40	Experimental Study on HP Cycle of a Flash Tank Economizer with Scroll Compressor – H. Zhao, et al.	Integrated Heat Pump for Residential Space Conditioning & Water Heating – J. Tomlinson, C. K. Rice, and E. Baskin
10:40 – 11:05	A CO_2 Thermosyphon as a Heat Source System for Heat Pumps — 4 Years of Market Experience – R. Rieberer, et al.	A Multiple-Function Solar Heat Pump System – M. Howlader, et al.
11:05 – 11:20	Summary of Poster Session 6	Summary of Poster Session 7
11:20 – 12:20	**Poster Session 6**	**Poster Session 7**
12:30 – 13:30	Lunch	Lunch
13:30 – 17:00	**Session 8: Experiences with Alternate Refrigerants** Chairperson: Prof. Horst Kruse	**Session 9: Country Research Program Overviews** Chairperson: Dr. Claus Boerner, Germany
13:30 – 13:55	Heat Pump Water Heater with Ejector Cycle Using CO_2 Refrigerant – H. Sakakibara	An Overview of R&D in Heat Pump Technology in Japan – S. Tonomura
13:55 – 14:20	CO_2 Heat Pumping Systems – K. Stenstadsvold & P. Nekså	10 Years of Swedish Research & Development in Heat Pumping Technology – J. Andersson & P. Rohlin
14:20 – 14:45	Alternate Refrigerants to HCFC 22 – S. Stanbouly	Research Programs in Canada – S. Hosatte
14:45 – 15:10	Effect of Climatic Conditions on Performance of Air-to-Water Reversible Heat Pump Using R290 as Refrigerant – J. Blanco, et al.	The Switzerland Research Program – T. Kopp
15:10 – 15:35	Heat Pumps with Hydrocarbons as Refrigerants for Small Residential Buildings – E. Wobst	EU Research Program Summary –(tbd)
15:35 – 16:00	Scroll Compressor Designs Dedicated to the European Heat Pump Market – N. Kämmer, et al.	U.S. Research Programs (Overview) – S. Szymurski
16:00 – 16:15	Summary of Poster Session 8	Research Activities in China – W. Xu
16:15 – 17:00	**Poster Session 8**	
17:00	**Conference Summary & Closing Session** P. Rohlin (IOC Chairman) & J. Ryan (U.S. DOE)	

Poster Program

Please note: This program is preliminary and subject to change

Session 2 Energy & Environment

P. Bony, E. Thomas, and K. Johnson (U.S.)
CO-Z-ing up to the customer: How to break through the first cost barrier

K. York, L. Sowers, and L. Stiles (U.S.)
Impact of thermal build-up on aquifier groundwater chemistry and microbiota

D. Giguere, G. Pajani, and S. Hosatte (Canada)
Demonstration project of advanced integrated HVAC & R systems in a Loblaws supermarket in Canada

M. Forsén and P. Lundqvist (Sweden)
The potential to reduce CO_2 emissions by use of heat pumps

E. Wobst (Germany)
Reduction of CO_2 emissions by heating of residential buildings with low cost heat pumps

Session 3 Applications

S. Bertsch and E. Groll (U.S.)
Air to water heat pump for low temperature climates

V. Minea (Canada)
High temperature heat pumps for resinous timber drying

K. Berglöf (Sweden)
Experience and potential of improved energy efficiency through performance and functionality inspections on refrigeration and air conditioning systems

N. Endo, T. Maeda, Y. Hasegawa, M. Sugai, H. Tsuboi, T. Endo, A. Morimitsu, and A. Yabe (Japan)
Energy saving performance of distributed air conditioning system for laboratory buildings

D. Petrás and P. Matej (Slovakia)
Possibilities of applying heat pump systems in Slovakia

G. Eggen and G. Vangsnes (Norway)
Heat pump; for district cooling and heating at Oslo Airport Gardermoen

Z-s. Yan, Q-y. Ma, and J-x. Liao (China)
Analysis of the present condition of the sewage source heat pump application in Northeast of China

T-t. Liu, J-g. Peng, G-q. Zhang, and X. Cheng (China)
Application of the surface water heat pumps in Hunan, China

X. Chen and G-q. Zhang (China)
Performance and operating experience of a lake water heat pump system for district heating and cooling in South China

T. Tanaka (Japan)
Investigation on operational reliability of heat pump system

T. He and Q-q. Wang (China)
Analysis of a surface-water heat pump system application

Z. Li, Q-q. Wang, and B. Lu (China)
Some aspects of application of water-loop heat pump systems in China

Y. Yao, Y-q. Jian, Z-l. Ma, and S-m. Deng (China)
Strategies for large scale application of water loop heat pump air conditioning systems in China

M. Howlader (Singapore)
Influence of different drying methods on the quality of fruits

Session 4 Ground- and Water-Source Heat Pumps

E. Lohrenz (Canada)
Geothermal energy storage systems

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Poster Program (cont.)

A. Snijders and L. Stiles (U.S.)
Efficient geothermal heat pump design utilizing underground thermal energy storage

J. Gentry, R. LeMaster, and J.D. Street (U.S.)
Thermal and cost benefit analysis of a geothermal pilot project at the Northwest Tennessee Correctional Facility

J. F. Urchueguía, L. Orquín, G. Romero, W. Cambien, and M. Ait Bahaiji (Spain)
Experimental study of an horizontal ground loop heat exchanger

E. Shafai, M. Bianchi, and H-P Geering (Switzerland)
Comparing new control concepts for heat pump heating systems on a test bench with the capability of house and earth probe emulation

T. Lindholm and P. Fahlén (Sweden)
Design and optimum control of a Swedish dual-source (air and ground) heat pump system

H. Halozan and R. Rieberer (Austria)
Ground source heat pumps – Overcoming market and technical barriers (IEA HPP Annex 29)

G. Romero, J.F. Urchueguia, W. Cambien, and T. Magraner (Spain)
Seasonal system performances for vertical ground coupled heat exchanger and comparison with air-to-water heat pump system

L. Patino, I. Orquín, J. F. Urchueguía, P. Fernández de Córdoba, F.R. Villatoro, and A. Montero (Spain)
Transient numerical solution for the heat equation: application to ground source heat pump systems

E. Dumont and M. Frère (Belgium)
Performance of ground source residential heat pumps

J. Wärnelöv (Sweden)
Ground source heat pump with a new type of compact collector

A. Prestschnik and H. Huber (Austria)
Analysis of a ground coupled heat pump heating and cooling system for a multi-story office building

R. Ooka (Japan)
Using ground heat exchanger utilizing building's cast-in-place concrete pile foundation

K. Sekine, R. Ooka, H. Suckho, M. Yokoi, and Y. Shiba (Japan)
Development of geothermal heat pump system with ground heat exchanger utilizing cast-in-place concrete pile foundation of a building

K. Nagano, T. Katsura, S. Takeda, E. Saeki, Y. Nakamura, A. Okamoto, and S. Narita (Japan)
Thermal characteristics of steel foundation piles as a ground heat exchanger

Y. Shiba, R. Ooka, K. Sekine, H. Suchko, and M. Yokoi (Japan)
Development of high performance water to water heat pump for ground source application

K. Nagano, T. Nogawa, T. Katsura, K. Shimakura, A. Okamoto, and S. Narita (Japan)
Development of Autonomous performance testing system of water source heat pump and actual performance of Japanese small water source heat pumps

A. Okamoto, S. Narita, and K. Nagano (Japan)
Development of ground source heat pump unit for residential use

Y-b Wang, B-x. Li, H-p. Tan, and Y. Li (China)
Optimum running of ground source heat pump under low load conditions

B-x Li, Y-b. Wang, H-p. Tan, and Y. Li (China)
Performance Analysis of combined system of ground source heat pump and exhaust air source heat pump

Y-s. Yu and Z-l. Ma (China)
Study of the integrated soil cool thermal storage and ground-coupled heat pump system

Z-q Yan (China)
Development and application of an innovative shallow ground water heat pump system

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Poster Program (cont.)

Session 5 Integration of Heat Pumps in CHP Systems

J. Brasz (U.S.)
Combined heating and power (CHP) systems with organic rankine cycles

T. Wagner (U.S.)
Cooling, heating, and power (CHP) systems – high efficiency, low emissions alternative to grid power

S. Obara and K. Kudo (Japan)
Study on improvement in energy efficiency of partial load driving of installing fuel cell network with geothermal heat pump and water electrolysis operation

H. Sasaki and H. Tsuda (Japan)
Development of a hybrid air conditioning system driven by low temperature waste heat

K. Olsen, et al. (U.S.)
Reciprocating engine driven cooling, heating and power packaged system

S. Fischer (U.S.)
Cooling, heating, and power application screening tool

J. Berry, et al. (U.S.)
Innovative integrated energy system converts "waste heat" to air conditioning

Session 6 Advanced Concepts – Components

S. Bertsch, K. Whitacre, and E. Groll (U.S.)
Modeling of a CO_2 thermosyphon for a ground source heat pump application

H. Kruse and H. Rüssmann (Germany)
Novel CO_2-heat pipe as earth probe for heat pumps without auxiliary pumping energy

P. Fahlén and F. Karlsson (Sweden)
Optimizing and controlling media flows in heat pump systems

J. Schiffman and D. Favrat (Switzerland)
Theoretical design and experimental investigation of a high speed, oil free radial compressor for domestic heat pumps

R. Sahinagic, L. Berlinger, and M. Imholz (Switzerland)
Frost formation in plate fin-and-tube heat exchangers of air heat pumps – conversion of low density frost into glacial frost

T. Karlsson and L. Vamling (Sweden)
Comparison of the flow fields of a pure fluid and a zeotropic mixture for condensation in a shell-and-tube condenser

J. Claesson and B. Palm (Sweden)
Condensation in plate heat exchanger; an experimental investigation

M. Zehnder and D. Favrat (Switzerland)
Experiences with hermetic scroll compressors with intermediate vapor injection port in heat pumps for high temperature lift heating applications

S. Wellsandt (Sweden)
Flow distribution in a herringbone microfin evaporation tube

E. Navarro, E. Granryd, P. Fernández de Córdoba, and J. F. Urcheuguía (Spain)
Monte Carlo techniques applied to theoretical and experimental analysis of refrigeration compressors

K. Sato (Japan)
An overview of the trends in research and development in heat pump technologies in Japan

X-y Li, Z-s. Yan, and Z. Li (China)
Experimental study of heat transfer enhancement of a new heat exchanger for heat pump systems

D. Liu, G-f. Tang, and F-y. Zhao (China)
Simulation and investigation on avoiding window-type heat pump frost through heat recovery system

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Poster Program (cont.)

A-s Pamitran, K-i Choi, and J-t Oh (Korea)
Two-phase pressure drop of R-410A, R-407C and CO_2 in horizontal evaporator with minichannels

Session 7 Technology – Advanced Systems and Equipment

Y-R Kwon and D. Berchowitz (U.S.)
Hermetic gas-fired residential heat pump

R. Romero, J. Siqueiros, and R. Best, et al. (Mexico, Spain)
Technological and Scientific Challenges in Heat Pumps

A. Jokar, S. Eckels, and M. Hosni (U.S.)
A heat pump for automotive applications

V. Baxter, J. Tomlinson, R. Murphy, M. Lapsa, and B. Ashdown (U.S.)
Advanced residential heat pump water heater development status

V. Baxter (U.S.)
Summary of advanced R&D activities conducted under IEA HPP Annex 26

D. Hall (U.S.)
Innovative integrated energy system converts waste heat to air conditioning

J. Andersson (Sweden)
Low energy cooling technologies (IEA Energy Conservation in Buildings and Community Systems)

C. (Kees) Jansen (Netherlands)
Electric heat pump with gas fired boiler

E. Dumont and M. Frère (Belgium)
Performance measurement and modeling of air source residential heat pumps

C. Wemhöner and T. Afjei (Switzerland)
A uniform energy-related characterization of heat pump systems - IEA HPP Annex 28

T. Afjei, C. Wemhöner, and R. Dott (Switzerland)
A generic calculation scheme to estimate seasonal performance of combined systems

B. Hafner (Germany)
Heat pump with high outlet temperature

B. Müller (Germany)
Development of a two-circuit heat pump for heating and domestic hot water supply

C. Arzano-Daurelle (France)
Year-round residential space conditioning systems (IEA HPP Annex 25)

K. Mashimo and T. Tanaka (Japan)
Practical study on desiccant air conditioning system in a supermarket

T. Yokoyama (Japan)
Research of gas-engine driven air conditioner for annual cooling operation

J. Jeong, K. Saito, S. Kawai, N. Nishiyama, and M. Kataoka (Japan)
Study on the absorption and compression hybrid air conditioning system

S. Nakano and T. Sakai (Japan)
Low electric input GHP

M. Kubota, Y. Hirota, Y. Sugiyama, N. Watanabe, N. Kobayashi, M. Hasatani, M. Kanamori, and M. Hiramatsu (Japan)
Development of hybrid type adsorption heat pump adding electric-operating heat pump

Y. Nakagawa, K. Inagaki, K. Saito, and S. Kawai (Japan)
Next generation gas-driven air-conditioning system with dehumidification process that can respond to higher setting temperature in cooling mode and higher ventilation

(cont. next page)

Poster Program (cont.)

K.Mori (Japan)
Development of Triple-effect Absorption Chiller-Heater

F-y. Zhao, D.Liu, G-f. Tang, and Z-q. Liu (China)
Airflow simulation and optimization analysis in multi air ducts of semi-conductive thermoelectric heat pump

W. Wang, Z-l. Ma, Y. Yao, Y-q. Jing, and Z-q. Yang (China)
A novel heat pump heating system initially applied in cold regions

Y. Zhao and H. Zhao (China)
Characteristic analysis of gas engine driven heat pump

S-r Park, Y-j Baik, and K-c Chang (Korea)
Heat recovery in multi GHP (gas-driven heat pump) system

Session 8 Experiences with Alternate Refrigerants

A. Kharazi and N. Muller (U.S.)
Preliminary study of an R718 vapor compression heat pump using a 3-port condensing wave rotor

D. Manole (U.S.)
ARTI air-conditioning and refrigeration technologies database

M. Fehrm (Sweden)
Natural Refrigerants Contra HFCs - Risks and Benefits

J. Blanco, J.F. Urchueguía, J.M Corberán, and J. Gonzálvez (Spain)
Design analysis of a finned tube heat exchanger for an air to water reversible heat pump working with propane (R290) refrigerant

M. Zehnder and D. Favrat (Switzerland)
Screening for refrigerant blends in high temperature lift heat pumps for retrofit in residential heating

M. Friedl and R. Kern (Switzerland)
Space heating and hot water supply with a transcritical CO_2 heat pump

J. Stene (Norway)
Residential CO_2 heat pump system for combined space heating and hot water heating

R. Aarlien, et al. (Norway)
Selected issues on CO_2 as working fluid in compression systems (IEA HPP Annex 27)

Å. Melinder (Sweden)
Updates on secondary fluids

B. Palm, P. Lundqvist, P. Fernando, and K. Andersson (Sweden)
Heat pump/refrigeration system with minimum charge

I. Martinez, J. Blanco, J. Santiago, J. Gonzálvez, and J.M. Corberán (Spain)
Performance of a water to water heat pump working with R407C when retrofitted to propane.

A. Tsujimori and M. Kato (Japan)
Mass transfer characteristics of the rectifier for absorption refrigeration cycle using TFE/NMP as a working fluid

N. Okaza, M. Mekata, T. Sawada, and K. Nakatani (Japan)
Comparison of CO2 heat pump cycles for water heater

S. Imai, H. Itsuki, M. Otake, H. Mukaiyama, and I. Kamimura (Japan)
Experimental results and evaluation of 2 stage compressor and expansion cycle using CO2

K. Sakitani (Japan)
Development of two-phase flow expander for CO2 air conditioners

S. Akagi, J-f. Wang, and E. Hihara (Japan)
Characteristic of two-phase ejector in carbon dioxide operated refrigeration cycle

D-s Jung and Y-s Ham (Korea)
Performance of HCFC 22 alternative refrigerant mixtures for residential air-conditioning and heat pumping applications

Technical Tours

1. Tour of Lake Las Vegas*

http://www.lakelasvegas.com

Due to its favorable climate, location, and other amenities, Las Vegas has the highest growth rate among all U.S. cities. Over the last ten years, the population of Las Vegas has grown by a full 55 percent. This growth provides the opportunity for development of new communities with energy-efficient housing. Lake Las Vegas is a premier new community located 28 km (17 miles) from central Las Vegas. The community is comprised of luxury residential villas, yacht and beach clubs, golf courses, restaurants, and hotels surrounding a large (1.4-sq. km) manmade lake.

Space conditioning (heating and cooling) for the Lake Las Vegas buildings is provided by water-source heat pumps and pond heat pumps with loops that are submerged in the lake. A major goal for Lake Las Vegas is an attractive, desirable setting for its occupants and owners as well as reduced energy consumption provided through heat pumping technologies.

We will travel by bus to the site, and our guide and presenter for the tour will be Mike Kapps, a lead engineer for the development. We will tour the development including the Yacht and Beach Club and see first-hand how the lake meets the heating and cooling needs of the community. The tour promises to be both scenic and informative.

2. Tour of Rocky Research*

http://www.rockyresearch.com

Rocky Research, located in nearby Boulder City and near Hoover Dam, is a research and development organization that has performed cutting-edge research in solid-vapor sorption technologies that can be used in thermally activated heat pumps. Rocky conducts research for the U.S. Department of Energy as well as for other customers in key areas required for the development and commercialization of sorption-based heating and cooling systems for residential and small commercial buildings. Rocky has had notable commercial successes with solid-vapor (ammoniated compounds) systems including large systems that can be used in conjunction with ammonia refrigeration (frozen-food processing and storage) and small systems such as hot/cold coolers for recreational vehicle applications.

We will travel by bus to Rocky Research, meet with our host and guide, Dr. Uwe Rockenfeller (Rocky's President), tour their 1200-sq.-m laboratory, and view some of the activities under way in solid-vapor sorption technology and thermal and vapor-compression heat pump research.

**Note: Each of the above tours also includes an optional behind-the-scenes look at the Caesars Palace Hotel. The chief engineer will lead a private tour of the hotel and its surroundings to showcase many of the hotel's engineering feats including state-of-the-art heating and cooling systems.*

Social Program

The 8th IEA Heat Pump Conference includes a Social Program to provide opportunities for the Conference participants and the accompanying persons to enjoy their visit to Las Vegas.

Welcome Reception

The Welcome Reception will be held in the Emperor's Ballroom at Caesars Palace—a regal ballroom rimmed in beautiful murals and faux colonnade that will enable conference attendees and their spouses to greet old friends and to make new acquaintances in luxury and style. Hors d'oeuvres and refreshments will be served.

Conference Banquet

All Conference participants, spouses, and exhibitors are invited to attend the Banquet (admission by ticket only). This Banquet is an excellent opportunity for conference participants and exhibitors to meet old friends from around the world—while making new friends in the heat pump community. William G. "Woody" Sutton, President of the Air Conditioning and Refrigeration Institute (ARI) will be the featured speaker. The Banquet will also be held in the Emperor's Ballroom at Caesars Palace.

Optional Show – Blue Man Group

The "Blue Man Group: Live at Luxor" is much more than entertainment. The show consists of three men with blue faces, heads, and hands, clad in industrial-looking uniforms, who are the main focus of the show. They are backed by a live, 17-piece band of plugged-in musicians that are augmented by a group of laser artists. These "techno-shamans" involve the audience in group activities during their performance. The show relies on sound and visual effects. No words are spoken, placing emphasis on the music. The sounds are percussion-based and have a tribal rhythm. Conventional instruments, as well as instruments designed and created by the group, are used.

Attire

For May, the average high temperature for Las Vegas is 85°F (29°C), the average low temperature is 60°F (16°C) with relative humidity of about 18%. Because it is warm in May, attendees and spouses are encouraged to bring light clothes. For events in the hotel, layered clothing may be desirable since the hotel spaces can be quite cool. Casual business attire (shirts with collars—coats and ties optional, comfortable clothes for women) is suitable for all meetings and receptions. Coats and ties (men) and cocktail or evening dresses (women) are appropriate for the Banquet. Casual attire is recommended for tours. Tour participants are encouraged to wear comfortable walking shoes.

Spouse Program

Las Vegas offers many unique and creative opportunities for spouses to explore the city, uncover Vegas mysteries, and make new acquaintances. The conference organizers have prepared half-day tours including a museum and shopping excursion, in addition to the Welcome Reception and Banquet, for spouses registered at the Conference.

Registration Form – 8th IEA Heat Pump Conference 2005

NOTE: Please fold & tear along perforated line, then fold this side in on the horizontal dashed lines, tape bottom edge, affix postage, and mail to the address on the back.

You may register either by (1) filling out the online form at www.ornl.gov/hp2005 OR (2) completing this form and sending it along with payment (payable to 8th IEA Heat Pump Conference) to:

Melissa Voss Lapsa
Oak Ridge National Laboratory
P.O. Box 2008, MS-6067
Oak Ridge, TN, USA 37831

Phone: +1-865-576-8620
Fax: +1-865-574-9331
Email: hp2005@ornl.gov

Name: *(Last, First, MI)* _____

Title: _____

Organization: _____

Address: _____

City, State, Postal Code, Country _____

Phone: _____ Fax: _____ Email: _____

Fold here second

Conference Registration

	No. of people	Cost
☐ Full-time Conference*- - -700 USD (775 USD after April 29, 2005) *(Includes attendance at sessions, proceedings on CD, reception, tours, & banquet)*	☐	_____ total
☐ Student*- - - - - - - - - - -200 USD (250 USD after April 29, 2005) *(Includes attendance at sessions, proceedings on CD, reception, & tours)*	☐	_____ total
☐ Spouse*- - - - - - - - - - -200 USD (250 USD after April 29, 2005) *(Includes reception, banquet, & shopping/museum excursion)*	☐	_____ total
**complimentary breakfast for guests staying at Caesars Palace, Conference Hotel*		
☐ Optional Show Ticket - - -77 USD *(Blue Man Group)*	☐	_____ total
Technical Tours – CHOOSE *(Available 1st come, 1st serve)* ☐ Lake Las Vegas ☐ Rocky Research ☐ Neither	☐	_____ *FINAL TOTAL*

Workshops
No. of people ☐ #1–Test Procedures and Seasonal Performance Calculation Methods
No. of people ☐ #2–Ground Source Heat Pumps – Overcoming Market & Technical Barriers

Fold here first

Payment Method

Check ☐ *(payable to: 8th IEA Heat Pump Conference)*

Credit ☐ Visa or Mastercard Only (*your billing statement will reflect a charge from UT-Battelle, LLC)*

Card Number: _____ Expiration Date: _____

Card Security Code No**: _____
**last 3 digits of the number in the signature line on the back of the credit card

Name as it appears on the card: _____

Billing Statement Address: _____

fold & tear along peforated line, fold on dashed lines, tape edge, and mail

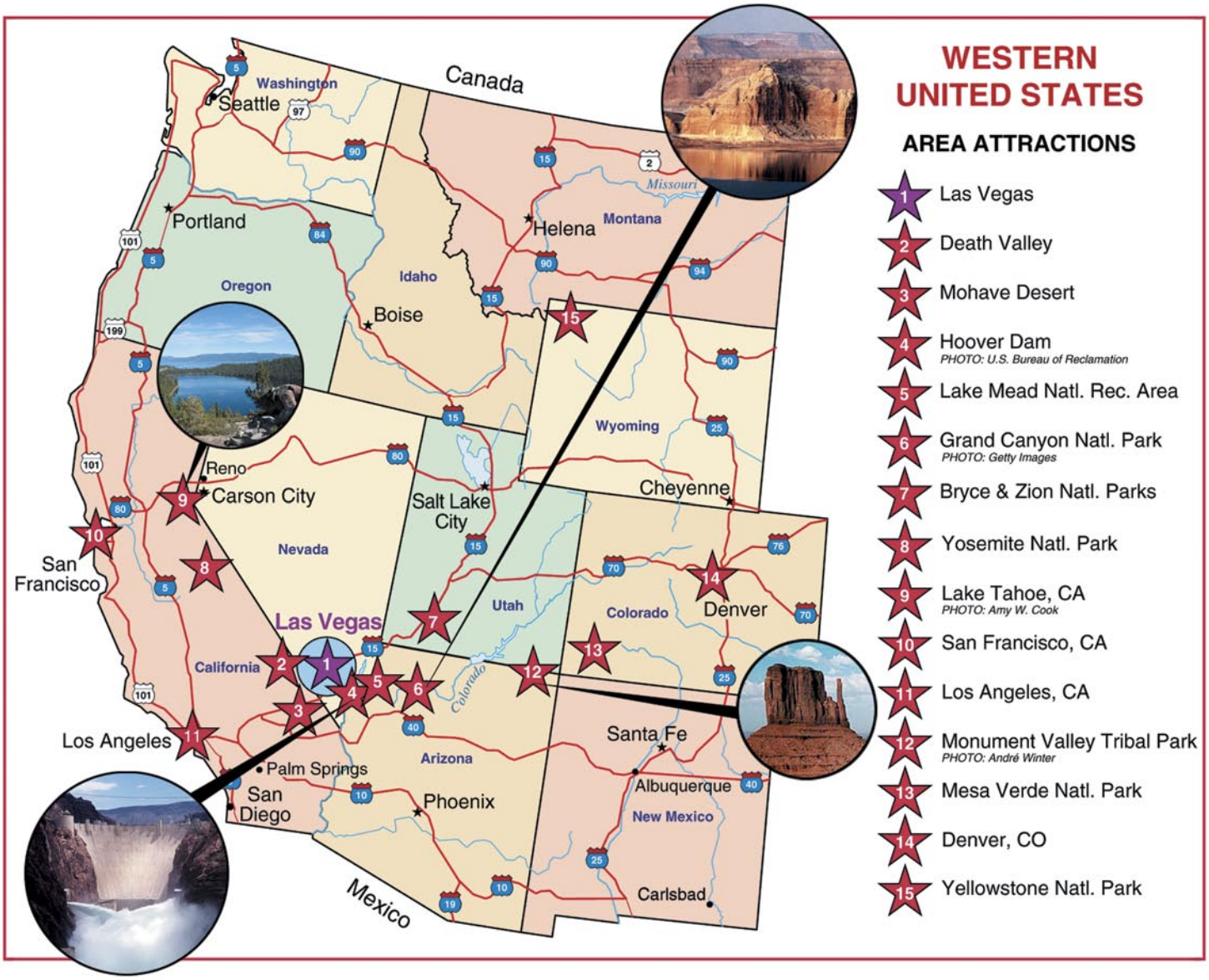
place
stamp
here

Melissa Voss Lapsa
Oak Ridge National Laboratory
P.O. Box 2008, MS-6067
Oak Ridge, TN USA 37831

Conference Location and Hotel

Caesars Palace
3570 Las Vegas Blvd., South
Las Vegas, Nevada 89109
Tel: + 1.702.731.7412, 702.731.7507
Fax: + 1.702.731.7324
http://www.caesars.com/Caesars/LasVegas/

Other Areas of Interest



Las Vegas, Nevada provides a gateway for families to explore the scenic western region of the United States. The map above highlights some locations that may be of interest. For more information about area sights and links to state tourist offices, see *www.ornl.gov/hp2005*; also visit the National Park Service website at *www.nps.gov/parks*.

8th International Energy Agency
HEAT PUMP CONFERENCE 2005