Refrigeration Conference Papers

R-1 Air-Side Heat Transfer Analysis
Room 310

Chairperson: William Murphy, University of KY, USA

R019 Effect of Coil Geometry on Frost-Free Finned-Tube Evaporator Performance: Christian J. L. Hermes and Marco E. Marques, Multibras Appliances, S.A., Brazil; Claudio Melo, Federal University of Santa Catarina, Brazil; Joaquim M. Goncalves, Federal Centre of Technological Education of Santa Catarina, Brazil

R069 Modified Wilson-Plot Technique for Heat Exchanger Performance: Strategies for Minimizing Uncertainty in Data Reduction: A. I. El Sherbini, Arindom Joardar and Anthony M. Jacobi, University of Illinois at Urbana-Champaign, USA

R147 Enhancement of Air-Side Heat Transfer in Offset-Strip Fin Arrays Using Unsteady Forcing: John M. Brutz, J. Craig Dutton and Anthony M. Jacobi, University of Illinois at Urbana-Champaign, USA

R-2 Performance of Refrigerant Mixtures
Room 314

Chairperson: Francois Billiard, IIR, France

R083 Staged Evaporation System for Refrigerant Blends with Large Temperature Glide: Denis Clodic and Wissam Rached, Ecole des Mines de Paris, France

R119 Energy Saving Refrigerant Blends Comprising R125, R134a, R600 or R600a: Neil A. Roberts and Owen R. Chambers, Rhodia Organique Fine Ltd., United Kingdom

R143 HFC & HC Blends as Refrigerants: Sergio Bobbo, Roberto Camporese and Laura Fedele, Padova Corso Stati Uniti, Italy; Roman Stryjek, Polish Academy of Sciences, Poland

R-3 Oil Compatibility, Return and Retention Studies I
Room 202

Chairperson: Carlos Infante Ferreira, Delft Univ. of Technology, The Netherlands

R044 Experimental Study on the Performance and Oil Return Characteristics of Multi-Split Air-Conditioning System for Medium Size Building: Kyoung Rock Kim, Sang Jin Tae and Keumnam N. Cho, Sungkyunkwan University, Korea; Je Myung Moon, Jong Yup Kim and Hyung Jin Kwon, Samsung Electronics Co., Ltd., Korea

R091 Oil Content Measurement in the Liquid Line of Refrigeration Equipments with the Three Transducers Array Method: Yvon Goth, CETTM, France

R104 Investigation of Oil Retention in Residential Heat Pumps: Lorenzo Cremaschi, Yun Ho Hwang and Reinhard Radermacher, University of Maryland, USA

R117 Nonflammable, Nonozone Depleting, Refrigerant Mixtures Suitable for Use in Mineral Oil: George H. Goble, Purdue University, USA

R171 Foam Flow of Oil-Refrigerant R134A Mixture in a Small Diameter Tube: Heryca Olenir Sousa Castro, Jose Luiz Gasche, Wanderson Paterlini Conti, UNESP-Sao Paulo State University, Brazil
### R-4 Heat Exchanger Analysis

**Room: 310**

**Chairperson: Anthony Jacobi, University of Illinois, USA**

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>R087</td>
<td>Assessing the Condensate-Drainage Behavior of Dehumidifying Heat Exchangers</td>
<td>Arindom Joardar, Zhong Ping Gu and Anthony M. Jacobi, University of Illinois at Urbana-Champaign, USA</td>
</tr>
<tr>
<td>R098</td>
<td>Heater Location Through Radiative Heat Optimization in a Finned Tube Evaporator</td>
<td>Ehab Mina and Cesar Gutierrez, University of Illinois at Urbana Champaign, USA</td>
</tr>
<tr>
<td>R112</td>
<td>An Experimental Study on Performance of Automotive Condenser and Evaporator</td>
<td>Seong Yeon Yoo, Chungnam National University, Korea; Dae Woong Lee, Halla Climate Control Co., Korea</td>
</tr>
<tr>
<td>R155</td>
<td>Altered Bi-Phase Flow Regime in Evaporative Coils</td>
<td>David A. Wightman, XDX Innovative Refrigeration LLC, USA, Bernard Wendrow, Consultant, XDX LLC, USA; Richard S. Sweetser, Exergy Partners Corp., USA, William M. Worek, Energy Resources Center (UIC), USA</td>
</tr>
<tr>
<td>R052</td>
<td>Exergy Analysis of Refrigeration Evaporators</td>
<td>Sanat Gapurovih Zakirov and Kudrat Fuadovich Karimov, Tashkent State Technical University, Uzbekistan</td>
</tr>
</tbody>
</table>

### R-5 Secondary Fluids and Systems

**Room: 314**

**Chairperson: Sung Jin Kim, Purdue University, USA**

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>R090</td>
<td>Thermophysical Properties Characterization of Microencapsulated Phase Change Material Slurry</td>
<td>Jorge L. Alvarado, University of Illinois at Urbana-Champaign, USA; Charles Marsh, Chang Sohn, U. S. Army Corps of Engineers, Engineer and Research Development Center, Illinois, USA; Dave Kessler, University of Illinois at Urbana-Champaign, USA</td>
</tr>
<tr>
<td>R124</td>
<td>Heat Transfer Characteristic in Ice Slurry Generator</td>
<td>Epifanio M. Ticona and Sergio Leal Braga, Pontifical Catholic University of Rio de Janeiro, Brazil</td>
</tr>
<tr>
<td>R125</td>
<td>Transport Coefficients of Ice Slurry in Plate Heat Exchanger</td>
<td>Hugo Jimenez Pacheco and Sergio Leal Braga, Pontifical Catholic University of Rio de Janeiro, Brazil</td>
</tr>
<tr>
<td>R142</td>
<td>Dendritic Ice Growth in Supercooled Water Inside Cylindrical Capsule</td>
<td>Juan Jose Milon Guzman and Sergio Leal Braga, Pontifical Catholic University of Rio de Janeiro, Brazil</td>
</tr>
</tbody>
</table>

### R-6 Dynamic System and Component Models

**Room: 202**

**Chairperson: David Tree, Purdue University, USA**

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>R009</td>
<td>Capacity Control of a DX VAV System and Its Modeling</td>
<td>Wu Chen, Zheng Li and Shiming Deng, The Hong Kong Polytechnic University, China</td>
</tr>
<tr>
<td>R073</td>
<td>Dynamic Modeling of Shell-and-Tube Heat-Exchangers: Moving Boundary vs. Finite Volume</td>
<td>Satyam Bendapudi, James E. Braun and Eckhard A. Groll, Purdue University, USA</td>
</tr>
<tr>
<td>R074</td>
<td>A Moving-Boundary Model of a Centrifugal Chiller System</td>
<td>Satyam Bendapudi, James E. Braun and Eckhard A. Groll, Purdue University, USA</td>
</tr>
<tr>
<td>R106</td>
<td>Measurements of the Dynamic Performance and Behavior of Air-Conditioning Systems Using a Dynamic Test Facility</td>
<td>Amr Gado, Yun Ho Hwang and Reinhard Radermacher, University of Maryland, USA</td>
</tr>
<tr>
<td>R158</td>
<td>Transient Modeling of Chilled Water Cooling Coils</td>
<td>Xiaotang Zhou and James E. Braun, Purdue University, USA</td>
</tr>
<tr>
<td>R167</td>
<td>Transient Modeling of Vapor Compression Refrigeration Systems Using Measured Compressor COP</td>
<td>Steve Pfister, The Coca-Cola Company, USA</td>
</tr>
</tbody>
</table>
R-7 Heat Transfer and Fluid Flow Fundamentals I
Room 310
Chairperson: Van Baxter, Oak Ridge Laboratories, USA

- R014 Pool Boiling of Refrigerant-Oil Mixtures on Enhanced Tubes Having Different Pore Sizes: Nae Hyun Kim and Chang Keun Min, University of Incheon, Korea
- R021 Convective Boiling Heat Transfer Characteristics of R410A in Microchannels: Rin Yun, Jae Hyeok Heo, Yong Chan Kim, and Jin Taek Chung, Korea University, Korea
- R035 Flow Boiling of Ammonia in Smooth Horizontal Tubes in the Presence of Immiscible Oil: Tahsin Boyman, Peter Aecherli, University of Applied Sciences of Central Switzerland, Switzerland; Anton Steiner, W. Wettstein AG für Kaltetechnik, Switzerland
- R061 Experimental Study on R-410A Condensation Heat Transfer and Pressure Drop Characteristics in Oblong Shell and Plate Heat Exchanger: Jae Hong Park, Yong Ha Kwon, and Young Soo Kim, Pukyong National University, Korea.
- R067 Analysis of Two-Phase Flow in Double-Pipe Condensers and Evaporators With Special Emphasis on Transition Zones: Numerical Model and Experimental Comparison: Joaquim Rigola, Sergio Morales, Gustavo Raush, and Carlos D. Perez Segarra, Universitat Politecnica de Catalunya, Spain

R-8 Sorption Systems I
Room 314
Chairperson: Clark Bullard, University of Illinois, USA

- R062 Analysis of Convective Instabilities of Binary Nanofluids: Yong Tae Kang, Kyung Hee University, Korea; Jake Kim and Chang Kyun Choi, Seoul National University, Korea
- R102 Experimental Study of a Dual-Chamber Vortex Generator for An Absorption Chiller: Jian Yu, Ali Ogut, and Yue Zhou, Rochester Institute of Technology, USA
- R129 Determination of Efficiency Limits for the Two-Bed Zeolite-Water Adsorption Chiller: Bostjan Cerkvenik, University of Ljubljana, Slovenia
- R148 The Specific Heat Capacity of Adsorbate-Adsorbent System: Hui Tong Chua, Anutosh Chakraborty, Xiao Lin Wang, National University of Singapore, Singapore
- R151 Simulation of the Silica Gel-Water Adsorption Chillers: Xiaolin Wang, Hui Tong Chua, and Kim Choon Ng, National University of Singapore, Singapore

R-9 Fault Detection and Diagnostics, and Performance Monitoring
Room 202
Chairperson: Glenn Hourahan, ACCA, USA

- R137 Fault Detection Based on Motor Start Transients and Shaft Harmonics Measured at the RTU Electrical Service: Peter R. Armstrong, Chris R. Laughman, Steven B. Leeb, and Leslie K. Norford, MIT, USA
- R138 The Energy Impact of Faults in U.S. Commercial Buildings: Kurt W. Roth, Detlef Westphalen, Patricia Llana, and Michael Feng, TiAX LLC Appliance and Building Technology Group, USA
- R146 Unitary Air Conditioner Field Performance: Todd M. Rossi, Field Diagnostic Services, Inc., USA
- R131 A Methodology for Diagnosing Multiple-Simultaneous Faults in Rooftop Air Conditioners: Haorong Li and James E. Braun, Purdue University, USA
- R145 An Economic Evaluation of Automated Fault Detection and Diagnosis for Rooftop Air Conditioners: Haorong Li and James E. Braun, Purdue University, USA
R-10 Heat Transfer and Fluid Flow Fundamentals II
Room 310
Chairperson: Piotr Domanski, NIST, USA

R038 Constrained Multi-Objective Optimization of a Condenser Coil Using Evolutionary Algorithms: Vikrant C. Aute and Reinhard Radermacher, University of Maryland, USA; Mahesh Valiya Naduvath, York International Corp., USA

R066 Numerical Stimulation of Complex Thermal Systems Involving Multiple Fin-And-Tube Heat Exchangers: Carles Oliet, Carlos D. Perez Segarra, and Assensi Oliva, Universitat Politècnica de Catalunya, Spain

R095 Experimental Heat Transfer Coefficients and Pressure Drop During Refrigerant Vaporisation Inside Plate Heat Exchangers: Giovanni A. Longo and Andrea Gasparella, University of Padova, Italy; Roberto Sartori, Onda spa, Italy

R097 Experimental and Numerical Study of the Flow and Heat Transfer in Plate Heat Exchanger Channels: Damir Dovic and Srecko Svaic, University of Zagreb, Croatia

R-11 Sorption Systems II and Dehumidification
Room 314
Chairperson: M. Kent Anderson, IIAR, USA

R107 Second Law Study of Ammonia-Water Double Effect Absorption Chiller: Nizar Ben Ezzine, Messaoud Barhoumi, Khalifa Mejibri and Ahmed Bellagi, Unité de Recherche Thermique et Thermodynamique des Procédés Industriels, Tunisia

R108 Thermodynamic Simulation of Ammonia-Water Double Effect Absorption Chiller: Nizar Ben Ezzine, Khalifa Mejibri, Messaoud Barhoumi and Ahmed Bellagi, Unité de Recherche Thermique et Thermodynamique des Procédés Industriels, Tunisia

R096 Experimental Analysis on Chemical Dehumidification of Air and Desiccant Regeneration with H2O/LiCl Solution: Giovanni A. Longo and Andrea Gasparella, University of Padova, Italy

R136 Analysis on the Operating Characteristics of a Household Dehumidifier: Hong Qi Li, Beijing University of Technology, China; Li Wen Jin, Xi'an Jiaotong University, China

R-12 Electronics Cooling
Room 310
Chairperson: Steve Szymurski, ARI, USA

R150 An Adsorption Chiller Driven by Thermoelectricity: Hui Tong Chua, Anutosh Chakraborty, Xiao Lin Wang, National University of Singapore, Singapore

R172 Review of Refrigeration Technologies for High Heat Dissipation Electronics Cooling: Suwat Trutassanawin and Eckhard A. Groll, Purdue University, USA

R173 Numerical Analysis of a Miniature-Scale Refrigeration System (MSRS) for Electronics Cooling: Suwat Trutassanawin and Eckhard A. Groll, Purdue University, USA

R-13 Oil Studies II and Low Temperature Applications
Room 314
Chairperson: Claudio Melo, Federal University of Santa Catarina, Brazil

R080 The Development of PAG Refrigeration Lubricants for Hermetic Compressors With CO2: Hanutomo Ikeda, Jun Ichi Yagi and Yasuhiro Kawaguchi, Idemitsu Kosan Co., Ltd., Japan;

R154 The Evaluation of PVE (Poly Vinyl Ether) as a Lubricant for Air Conditioning System Converted from HCFC22 to Either HFC410A or HFC407C: Masato Kaneko, Jun Ichi Yagi, Shoich Tominaga and Masaki Tamano, Idemitsu Kosan Co., Ltd., Japan; Hideki Suto, Apollo America Corporation, USA
R032 Low Temperature Refrigeration Utilizing Zeotropic Mixtures:  
Henry E. Howard, Praxair, USA

R149 A Numerical Study of the Hampson-Type Joule-Thomson Cooler:  
Hui Tong Chua, Xiao Lin Wang, Hwee Yeann Teo and Kim Choon Ng, National University of Singapore, Singapore

R-14 System and Component Analysis I  
Room 202
Chairperson: Mark Spatz, Honeywell, USA

R024 Validation of Methods for Tuning System Charge Predictions in Unitary Equipment:  
Bo Shen, James E. Braun and Eckhard A. Groll, Purdue University, USA

R088 A Performance Based Method to Determine Refrigerant Charge Level in Unitary Air Conditioning and Heat Pump Systems:  
Keith A. Temple, KAT Consulting, USA

R111 The Assessment of SEER Relating to Capacity Modulation in the Air Conditioner with Two Compressors:  
Chan Ho Song, Won Hee Lee, Seung Youp Hyun, Yoon Jei Hwang and Baik Young Chung, LG Electronics, Korea

R114 The Impact of Evaporator Fouling on the Performance of Packaged Air Conditioners:  
Li Yang, James E. Braun and Eckhard A. Groll, Purdue University, USA

R127 Numerical Calculation of Mass Flow Rate in Capillary Tubes Using 'Art', an Advanced Simulation Software:  
Jose Miguel Corberan, Universidad Politecnica de Valencia, Spain; David Fuentes, Universidad Industrial de Santander, Columbia; Jose Gonzalvez, Universidad Politecnica de Valencia, Spain

R164 A Study on the Capacity Control of a Variable Speed Vapor Compression System Using Superheat Information at Compressor Discharge:  
Doo Soo Yang, Hyundai Motor Company & Kia Motors Corporation, Korea; Gil Bong Lee, Min Soo Kim, Young Man Cho, Seoul National University, Korea; Yoon Jei Hwang and Baik Young Chung, LG Electronics Co., Ltd., Korea

R-15 Transcritical CO₂ Cycle I  
Room 310
Chairperson: John Mazione, U. S. Army, USA

R023 Scroll Expander for Carbon Dioxide Air Conditioning Cycles:  
Detlef Westphalen and John Dieckmann, TIAX LLC, USA

R031 Transcritical Carbon Dioxide Based Heat Pumps: Process Heat Applications:  
Jahar Sarkar, Souvik Bhattacharyya and M. Ram Gopal, Indian Institute of Technology, India

R070 Numerical Study and Experimental Validation of a Transcritical Carbon Dioxide Refrigerating Cycle:  
Joaquim Rigola, Sergio Morales, Gustavo Raush, Carlos C. Perez Segarra and Nicolas Ablanque, Universitat Politecnica de Catalunya, Spain

R101 Residential Space Conditioning and Water Heating with Transcritical CO₂ Refrigeration Cycle:  
Clark Bullard and John Rajan, University of Illinois at Urbana-Champaign, USA

R105 Performance of CO₂ Cycles with a Two-Stage Compressor:  
Yun Ho Hwang, Aydin Celik and Reinhard Rademacher, University of Maryland, USA

R165 Effect of Gas Cooler Size on Its Performance and Entire R744 A/C System:  
Chang Y. Park and Predrag S. Hrnjak, University of Illinois at Urbana-Campaign, USA

R-16 Domestic Refrigerator/Freezers  
Room 314
Chairperson: Bill Hutzel, Purdue University, USA

R002 The Components and Control Methods for Implementation of Inverter-Controlled Refrigerators/Freezers:  
Wen Ruey Chang, Der Yeong Liu, San Guei Chen and Nan Yi Wu, Industrial Technology and Research Institute, Taiwan
R020 Refrigerant Charge and Ambient Temperature Effects on the Refrigeration Cycle of a Small Capacity Food Freezer: Marco F. Torchio and Paolo Anglesio, Politecnico di Torino, Italy

R041 Experimental Characterization of Small Reciprocated Compressor Working With Azeotropic Blends of Alternative and Natural Refrigerants: Michael Khmel’njuk, Odessa State Academy of Refrigeration, Ukraine; Valery Vozny, Ukrainian Research Institute “VESTA”, Ukraine; Victor Mazur, Odessa State Academy of Refrigeration, Ukraine

R072 Design of Energy-Efficient Display Case Evaporators: Ramesh Chandrasekharan and Clark Bullard, University of Illinois at Urbana-Champaign, USA

R078 Experimental and Numerical Steady-State Analysis of a Top-Mount Refrigerator: Joaquim Manoel Goncalves, Federal Center of Technological Education of Santa Catarina, Brazil; Claudio Melo, Federal University of Santa Catarina, Brazil

R109 The Effects of Non-Condensable Gases in Household Refrigerators: Luca Cecchinato, Universita degli Studi di Padova, Italy; Maurizio Dell’Eva, ACC Appliances Components Companies, Italy; Ezio Fornasieri, Universita degli Studi di Padova, Italy; Massimo Marcer, ACC Appliances Components Companies, Italy; Claudio Zilio, Universita degli Studi di Padova, Italy

R17 System and Component Analysis II

Room 202

Chairperson: Bruce Hunn, ASHRAE, USA

R037 Numerical Challenges in Simulation of a Generalized Vapor Compression Refrigeration System: David H. Richardson, Vikrant Aute, Jonathan Winkler and Reinhard Radermacher, University of Maryland, USA

R071 Design and Optimization of Capillary Tube–Suction Line Heat Exchangers: Gaurav Jain and Clark Bullard, University of Illinois at Urbana-Champaign, USA

R075 Experimental Study on Adiabatic Flow of R-22 Alternatives in Capillary Tubes: Claudio Melo and Luis Antonio Torquato Vieira, Federal University of Santa Catarina, Brazil; Roberto Horn Pereira, Embraco S.A., Brazil

R130 Modeling Adjustable Throat-Area Expansion Valves: Haorong Li, James E. Braun and Bo Shen, Purdue University, USA

R053 On Refrigeration Effects of the Power Cycles with Gas-Dynamic Regeneration: Igor I. Samkhan, Yaroslavl State Technical University, Russia

R18 Transcritical CO₂ Cycle II and Alternative Refrigeration Technologies I

Room 310

Chairperson: Reinhard Radermacher, University of Maryland, USA

R153 Transcritical CO₂ Refrigeration Cycle with Ejector-Expansion Device: Da Qing Li and Eckhard A. Groll, Purdue University, USA

R166 Effect of Internal Heat Exchanger on Performance of Transcritical CO₂ Systems with Ejector: Stefan Wilfried Elbel and Predrag S. Hrnjak, University of Illinois at Urbana-Champaign, USA

R079 Using the TEWI Methodology to Evaluate Alternative Refrigeration Technologies: Reinaldo Maykot, Gustavo C. Weber, and Ricardo A. Maciel, Empresa Brasileira de Comпрессores SA, Brazil

R162 Economic Competitiveness of Cryogenic Refrigeration Systems for Transported Product: Howard Pedolsky and Stuart Fedder, Utkram Industries, USA; Konstantine Gavrylov, Eco-Fridge Production, Ukraine

R163 Environmental Friendliness of Cryogenic Refrigeration Systems for Transported Product: Howard Pedolsky and Samuel Thurston, Utkram Industries, USA; Roland Gavrylov, Eco-Fridge Production Company, Ukraine

R19 Noise Issues in AC&R Equipment

Room 314

Chairperson: Jerry Wurm, Retired, USA

R092 Damping Patch Placement on Outdoor Unit of Air-Conditioner by Using Structural Intensity Technique: Kyu Sik Kim and Yeon June Kang, Seoul National University, Korea; Sim Won Chin, In Hwa Jung and Jung Woo Lee, LG Electronics Inc., Korea
R100  Noise Reduction Technology With Porous Metal for Refrigerant Two-Phase Flow Through the Expansion Valve: Satoshi Hirakuni, Masahiro Nakayama, Hiroaki Makino, Atsushi Mochizuki and Yoshihiro Sumida, Mitsubishi Electric Corporation, Japan

R-20 Heat Transfer Performance Under Frost Conditions
Room 202
Chairperson: Steve Memory, Modine, USA

R034  Air-Side Heat Transfer Augmentation of a Refrigerator Evaporator Using Vortex Generation: Andrew Sommers and Anthony M. Jacobi, University of Illinois at Urbana-Champaign, USA
R054  An Empirical Study of Frost Accumulation Effects on Louvered-Fin, Microchannel Heat Exchangers: Yan Ping Xia, Predrag S. Hrnjak, and Anthony M. Jacobi, University of Illinois at Urbana-Champaign, USA
R058  Effects of Fin and Tube Alignment on the Heat Transfer Performance of Finned-Tube Heat Exchangers with Large Fin Pitch: Yong Han Kim and Yong Chan Kim, Korea University, Korea; Jung Rea Kim, Samsung Electronics Co., Ltd., Korea; Dae Sik Sin, Korea University, Korea
R121  Modeling of Frost Behavior on a Cold Plate: Dong Keun Yang, Dong Hoon Lee, Jung Soo Kim and Kwan Soo Lee, Hanyang University, Korea
R161  Frost Formation on a Cold Cylinder Surface in Cross Flow: Dong Hoon Lee, Dong Keun Yang and Kwan Soo Lee, Hanyang University, Korea

R-21 Alternative Refrigeration Technologies II
Room 310
Chairperson: Joost Brasz, Carrier Corporation, USA

R022  A New Ericsson Cycle Comprising a Scroll Expander and a Scroll Compressor for Power and Refrigeration Applications: Young Min Kim, D. K. Shin and J. H. Lee, Korea Institute of Machinery & Materials, Korea
R025  Test Results of a Screw Type Expander/Compressor and the Implication of Phase Separators on the Refrigeration Process: Henrik A. Ohman, Svenska Rotor Maskiner AB, Sweden
R049  Performance of Compressor Driven Metal Hydride Cooling Systems Under Different Operating Conditions: Sagnik Mazumdar, M. Ram Gopal and Souvik Bhattacharyya, Indian Institute of Technology, India
R068  Ranking of Working Fluids for Organic Rankine Cycle Applications: Lars J. Brasz, SUNY at Buffalo, USA; William M. Bilbow, WMB-Enterprises, USA
R160  An Investigation into the Feasibility of the Use of Water as a Refrigerant: Brandon F. Lachner, Jr., Gregory F. Nellis and Douglas T. Reindl, University of Wisconsin-Madison, USA

R-22 Heat Pump Systems I
Room 310
Chairperson: Ty Newell, University of Illinois, USA

R081  Thermal Performance of a Direct Expansion Solar Assisted Heat Pump: Vladimir Soldo, Tonko Curko and Igor Baien, University of Zagreb, Croatia
R085  Performances of a New Air-to-Water Heat Pump System with Controlled Capacity: Nicolas Flach Malaspina, Jean Marc Lebreton, EDf R&D Center in the Thermal Group, France; and Denis Clodic, Ecole des Mines de Paris, France
R086  A New Installation for Part Load Testing of Air to Water Single Stage Chillers and Heat Pumps: Philippe Riviere, Center for Energy Studies, Ecole des Mines de Paris, France; Nicolas Flach Malaspina and Jean Marc Lebreton, EDf R&D Center, Thermal System Group, France
R093  Compressor Performance Analyses of Refrigerants (R22 and R407C) with Various Lubricants in a Heat Pump: Barbara H. Minor and Akimich Yokozeki, DuPont Fluoroproducts, USA
R168  Sensible Heat Recovery of Ventilation Energy of Heat Pump in Heating Mode: An Nguyen and Youn Gil Kim, Korea Institute of Science and Technology, Korea
**R-23 HVAC in Buildings**

**Room 314**

**Chairperson: Yan Chen, Purdue University, USA**

R033 Simulations of Task-Ambient Air-Conditioning Systems by Computational Fluid Dynamics, Refrigerating-Cycle Simulator, and Pedestrian-Behavior Model: Kazuhiro Fukuyo, Yamaguchi University, Japan

R057 A New Control Strategy of Indoor Air Temperature in an Air-Conditioning System: Cheng Zhi Lou, Guo Qing Cao and Da Wei An, Tianjin University, China; Gang Lou, The Hong Kong Polytechnic University, Hong Kong

R133 Numerical Analysis of Internal Flow Field of Multi-Blade Centrifugal Fan for Floor Standing Air-Conditioner: Jia Bing Wang, Ying Da Ou and Ke Qi Wu, Huazhong University of Science and Technology, China

R152 Next-Generation Gas Driven Air-Conditioning System Under the Condition of the Higher Setting Temperature of the Room in the Cooling Mode and Higher Ventilation: Katsuyuki Inagaki and Yasuaki Nakagawa, TOSEIZ Co., Ltd., Japan; Kiyoshi Saito and Sunao Kawai, WASEDA University, Japan

**R-24 Heat Pump System II and Automotive Air Conditioning**

**Room 310**

**Chairperson: Pedrag Hrnjak, University of Illinois, USA**

R010 Energy and Economic Performance Comparison of Gas Engine and Electric Driven Air-To-Water Heat Pump: Rong Rong Zhang, Xue Sheng Lu, Shu Ze Li, and An Zhong Gu, Shanghai Jiaotong University, China

R016 Sewage Heat Source Pump System’s Application Examples and Prospect Analysis in China: Wen Zhong Zhou, Interchina Aihua Municipal & Environmental Engineering Co., Ltd., China; Jian Xing Li, Tianjin University, China

R036 Experimental Analysis of an Automotive Air Conditioning System With Two-Phase Flow Measurements: Shu Jun Wang and Jun Jie Gu, Carleton University, Canada

R060 Application of Energy Efficient Scroll Compressor for Small Cars: Sangeet Hari Kapoor, Sachin Paramane, and Gyan Arora, TATA Motors, India

**APPENDIX A: Additional paper from the 2000 Refrigeration Conference.**

R088 Enhancement of Heat Transfer Rates During Forced Convection Condensation of R-134a on Horizontal Finned Tubes: K. N. Agrawal, University of Roorkee, India; Ravi Kumar, Hindustan College of Science & Technology, India; H. K. Varma, Moradabad Institute of Technology, India; B. Mohanty, University of Roorkee, India