SUNDAY, 6/29 8 to 10 a.m.

Symposium KC-03-01

Advances and Issues in Residential Thermal Distribution Efficiency

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems
APC Liaison: Ronald L. Shelton, P.E., Oak Ridge National Laboratory, Oak Ridge, TN
Chair: Keith A. Temple, Ph.D., P.E., Member, IBACOS, Inc., Pittsburgh, PA

This symposium is one of a series on residential thermal distribution efficiency, which is the subject of ASHRAE Standard 152P. These papers address several key topics related to the performance and evaluation of forced-air systems and the relationship to thermal distribution efficiency.

1. System Interactions in Forced-Air Heating and Cooling Systems, Part II: Continuous Fan Operation (RP-1165)
Lixing Gu, Ph.D., P.E., Member, Muthusamy V. Swami, Ph.D., and Philip W. Fairey, Member, Florida Solar Energy Center, Cocoa, FL

2. Evaluation of Flow Capture Techniques for Measuring HVAC Grille Airflows
Iain Walker, Ph.D., Member, and Craig P. Wray, Member, P.Eng., Lawrence Berkeley National Laboratory, Berkeley, CA

3. Duct Leakage in New Washington State Residences: Findings and Conclusions
David Hales, Andrew Gordon, and Michael Lubliner, Member, WSU Energy Program, Olympia, WA

4. Effect of Airflow and Heat Input on Duct Efficiency
John W. Andrews, Ph.D., P.E., Member, Brookhaven Nationan Laboratory, Upton, NY

5. Field Evaluation of a New Device to Measure Air Handler Flow
Paul Francisco, Member, Ecotope, Inc., Seattle, WA; Larry Palmiter, Ecotope, Inc., Seattle, WA

Symposium KC-03-02

Inverse Methods for Calculating Energy Savings from Energy Conservation Retrofits

Sponsor: TC 04.07 Energy Calculations
APC Liaison: Wayne Frazell, P.E., Ft. Worth, TX
Chair: Jan F. Kreider, Ph.D., P.E., Member, K&A, LLC, Boulder, CO

During the past decade, significant improvements in establishing accurate, pre-retrofit baselines for commercial and institutional buildings have been achieved. This symposium demonstrates some of these approaches and how they can be used to estimate the actual energy savings from building retrofits. Two papers report on ASHRAE 1050RP.

1. Inverse Modeling Toolkit - Numerical Algorithms (RP-1050)
John Kelly Kissock, Ph.D., P.E., Member, University of Dayton, Dayton, OH; Jeff Haberl, Ph.D., P.E., Member, and David E. Claridge, Ph.D., P.E., Member, Texas A&M University, College Station, Texas

2. Inverse Model Toolkit: Application and Testing (RP-1050)
Jeff S. Haberl, Ph.D., P.E., Member, Atch Sreshthaputra, Student Member, and David E. Claridge, Ph.D., P.E., Member, Texas A&M University, College Station, TX; John Kelly Kissock, Ph.D., Member, University of Dayton, Dayton, OH

3. Comparison of Methods for Predicting Monthly Post-Retrofit Energy Use in Buildings
Zhiqiang Chen, Valeo Climate Control Corp., Auburn Hills, MI; Ron M. Nelson, Ph.D., P.E., Member, and Daniel A. Ashlock, Iowa State University, Ames, IA

Seminar 1

Data Center and Telecommunication Room Cooling of High Density Heat Loads

Sponsor: TG 9 High Density Electronic Equipment Facility Cooling
APC Liaison: Joy Altwies, Farnsworth Group Inc., Madison, WI
Chair: Donald L. Beaty, P.E., Member, DLB Associates Consulting Engineers, Wanamassa, NJ

The heat rejection requirements of equipment installed in data centers and telecommunications facilities are changing dramatically. This seminar focuses on the fundamental knowledge required for the design of facilities with the potential for high heat loads (>100 watts per square foot).

1. GR-3028-CORE: Thermal Management in Telecommunications Central Offices
Magnus K. Herrlin, Ph.D., Member, Telcordia Technologies. Inc., San Francisco, CA

2. Data Center Environmental Requirements
Roger R. Schmidt, Ph.D., P.E., Member, IBM Corp., Poughkeepsie, NY

3. Data Center Air Cooling Guidelines
Christian Belady, P.E., Member, Hewlett Packard, Richardson, TX

4. Measuring and Reporting Computing Equipment Heat Loads
Allen Buskirk, Echelon Corporation, San Jose, CA

5. Best Practices in Data Center and Telecom Room Design
Donald L. Beaty, P.E., Member, DLB Associates Consulting Engineers, Wanamassa, NJ

Seminar 2

Developments in Combustion Turbine Inlet Air Cooling

Sponsor: TG 9 Combustion Gas Turbine Inlet Air Cooling Systems APC Liaison: Michael R. Brambley, Ph.D., Pacific Northwest National Laboratory, Richland, WA
Chair: Richard J. Kooy, P.E., Member, Chicago Bridge & Iron Company (CB&I), Plainfield, IL

The fraction of power generated from combustion turbines is increasing rapidly, as many high-efficiency combustion turbines plants are installed and commissioned. This may further increase the relative value of on-peak to off-peak power, since combustion turbine output decreases significantly at high ambient temperatures. This seminar highlights installations that cool the inlet air to combustion turbines in order to enhance their performance, as well as some of the technology developments in this expanding field.

1. Some Kansas City Area Turbine Inlet Cooling Installations
William E. Stewart, Ph.D., P.E., Member, InterMountan Research, Olathe, KS

2. Commissioning Turbine Inlet Air Chilling Systems
Kurt M. Liebendorfer, Member, The Stellar Group, Jacksonville, FL

3. Ammonia Absorption Maximizes the Benefits of Turbine Inlet Cooling - But Is It Cost Competitive?
Donald C. Erickson, Member, Energy Concepts Co., Annapolis, MD

4. Formate-Based Heat Transfer Fluid Dramatically Improves the Performance of Chiller-Based Inlet Air Heating and Cooling Loops
John H. Hallman, Member, Clearwater International LLC, Houston, TX

Seminar 3

Energy Efficiency Opportunities in Supermarket Display Cases

Sponsor: TC 10.07 Commercial Food and Beverage Cooling Display and Storage
APC Liaison: Kenneth M. Clark, P.E., Burns & McDonnell, Kansas City, MO
Chair: David Hinde, Member, Hill PHOENIX, Covington, GA

The cooling load required by refrigerated display cases accounts for a major source of energy consumption in supermarket refrigeration systems. This session evaluates the most commonly used type of display case, quantifying where inefficiencies occur and identifying and testing specific enhancements that will be incorporated into a high-efficiency prototype. Multiple aspects affecting the overall performance and energy efficiency of an open, multi-deck medium-temperature display case are presented in detail, including improvements in evaporator heat transfer and air curtain modeling.

1. Analysis of Energy Enhancing Measures in Supermarket Display Cases
Ramin Faramarzi, P.E., Member, Southern California Edison, Irwindale, CA

2. Survey and Rating of High-Efficiency Display Cases
David H. Walker, P.E., Member, Foster-Miller, Inc., Waltham, MA

3. Air Curtain Analysis in an Open Refrigerated Display Case Using CFD Techniques
Homayun Navaz, Ph.D., Kettering University, Flint, MI

4. Enhancement of Evaporator Heat Transfer in Refrigerated Display Cases
Massoud Neshan, Member, Wolverine Tube, Huntsville, AL

Seminar 4

How Much Outdoor Air Do You Need and Why?

Sponsor: Standards Committee - SSPC 62; Board Policy Committee on Standards
APC Liaison: Carl N. Lawson, PWI Consulting Engineers, Durham, NC
Chair: Lawrence J. Schoen, P.E., Member, Schoen Engineering Inc, Columbia, MD

Greater outdoor ventilation rates correlate with increased comfort and satisfaction, according to numerous studies. However, higher ventilation rates place burdens on system capacity and first cost, operating cost and in some cases moisture control and outdoor contaminant control. What is the science behind the higher rate arguments? What are the costs and practical difficulties of providing these higher rates? What is the history of minimum outdoor air rates in codes and what is the correct balance that a code minimum document should strike? Has ASHRAE's proposed revision to the ventilation rate procedure met this challenge?

1. Ventilation and Health: State of the Art
Jan Sundell, Member, Sci. Dr., Technical University of Denmark, Lyngby, Denmark

2. History and Background of Ventilation Rates
Frederick H. Kohloss, P.E., Presidential Member, Fellow, Honolulu, HI

3. Rationale for Code Minimum Ventilation Rates
Steve Taylor, P.E., Member, Taylor Engineering LLC, Alameda, C

4. Relationship of Ventilation Rates and CO_2 Concentrations with Occupant Health
William J. Fisk, P.E., Member, P. Eng, Lawrence Berkeley National Laboratory, Berkeley, CA

5. Rationale for Proposed Revision of Ventilation Rate Procedure in Standard 62
Andrew K. Persily, Ph.D., Member, National Institute of Standards and Technology, Gaithersburg, MD

Seminar 5

Indoor Air Quality and Mold: Legal Issues and Liability Concerns for Engineers and Related Industry Professionals

Sponsor: TG1 General Legal Education
APC Liaison: John B. Bisset, P.Eng., Chorley & Bisset, Ltd., London, ON, Canada
Chair: Dale E. Walker, J. D., Shook, Hardy & Bacon, L.L.P., Kansas City, MO

With the public, media and lawyers paying increasing attention to indoor air and health effects, have you wondered what the professionals are doing when building occupants start complaining about indoor air quality or mold? This seminar brings together experienced professionals who will share their ideas for preventing problems from arising, dealing effectively with complaints, finding qualified experts and consultants for testing and remediation, communicating with building occupants, and remediating problems. The seminar also explores litigation trends, defense strategies and liability avoidance.

1. The Building Owner's Perspective
John Craig, Jones Lang LaSalle Americas, Inc., Chicago, IL

2. Remediation Options
Holly Bailey, P.E., Member, Bailey Engineers Corp., Palm Beach Gardens, FL

3. Communications and Risk Control
George Benda, Member, Chelsea Group Ltd., Itasca, IL

4. Litigation Trends and Defense Strategies
Christopher M. McDonald, Associate, J. D., Shook, Hardy & Bacon, L.L.P., Overland Park, KS

Seminar 6

Solar Domestic Hot Water Applications

Sponsor: TC 06.07 Solar Energy Utilization; 2.8 Building Environmental Impact and Sustainability
APC Liaison: Arthur P. Garbarino, Air Service Inc., West Palm Beach, FL
Chair: Andrew Price, Associate, Franklin Energy Services, Port Washington, WI

This seminar presents two perspectives of solar domestic hot water systems. A program aimed at increasing the installation of renewable energy is presented along with owners' perspectives of living with their solar domestic hot water system. Presentations cover issues such as installing used solar panels, recommissioning a 20-year-old system and dealing with normal maintenance issues.

1. Recommissioning of the Quaker Housing Solar Domestic Hot Water System
Judy Olson, Quaker Housing, Madison, WI

2. Wisconsin Focus on the Renewable Energy Program
Paul Schuller, P.E., P. Eng, Franklin Energy Services, Port Washington, WI

3. Northland College Environmental Living and Learning Center
Thomas Wojciechowsky, Bad River Tribe, Odanah, WI

4. Solar Domestic Hot Water for the Solar-Decathlon
Michael Wassmer, Student, University of Colorado, Boulder, CO

Forum 1 8 to 8:50 a.m.

Hunter Curves: Are They Obsolete?

Sponsor: TC 06.06 Service Water Heating
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Moderator: Wayne Webster, P.E., Member, MBA, K-Way Enterprises Inc, Ottawa, ON, Canada

Hunter Curves were originally developed in the 1930s to apply a diversity to pipe flow when the number of fixtures connected to a system became large. Recently there has been a trend to reduce the consumption required by fixtures. This conservation related initiative is expected to become mainstream, and will have a significant effect on water flow requirements and the size of supply and disposal piping. Associated construction cost savings may be available to industry if these updated values are readily available and known. Discussion will center on what, if any, ASHRAE initiatives and sponsored research should be undertaken.

Forum 2 9 to 9:50 a.m.

Standard 52.2 Workshop: Tips and Suggestions to Get You Up and Running

Sponsor: TC 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Moderator: James T. Hanley, Member, RTI, Research Triangle Park, NC

Having problems getting your 52.2 test rig to run smoothly? Not sure how best to set up your sampling system? Confused on how to run some of the qualification tests? At this forum, tips and suggestions from test rig operators will be shared addressing these and many other issues. Bring along a few tips to share with the group as well as a few problems that you'd like someone to offer a tip on.

SUNDAY, 6/29 10:15 a.m. to 12:15 p.m.

Symposium KC-03-03

Borehole Testing, and Solar Assisted Geothermal Heat Pumps

Sponsor: TC 06.08 Geothermal Energy Utilization; TC 9.04
APC Liaison: Kirk T. Mescher, P.E., CM Engineering, Columbia, MO
Chair: J.B. Singh, Member, J & P Engineers, Kendall Park, NJ

In situ tests to determine soil thermal conductivity and borehole resistance are often difficult to interpret. The discussion covers the development of an algorithm to remove variable heat rate effects. Also, the discussion includes the development of a quick method to calculate the minimum testing time necessary to estimate thermal conductivity within 10% of estimated value for a long test. There is a discussion of a solar assisted ground source geothermal system for commercial buildings in cold climates.

1. Removing Variable Heat Rate Effects from Borehole Tests
Richard A. Beier, Ph.D., Associate Member, and Marvin D. Smith, Ph.D., P.E., Member, Oklahoma State University, Stillwater, OK

2. Minimum Duration of In-Situ Tests on Vertical Boreholes
Richard A. Beier, Ph.D., Associate Member, and Marvin D. Smith, Ph.D., P.E., Member, Oklahoma State University, Stillwater, OK

3. Assessment of the Viability of Hybrid Geothermal Heat Pump Systems with Thermal Collectors
Andrew D. Chiasson, and Cenk Yavuzturk, Ph.D., Member, University of Wyoming, Laramie, WY

4. A Study of Geothermal Heat Pump and Standing Column Well Performance (4662) (RP-1119)
Simon Rees, Ph.D., Member, Zheng Deng, Student Member, and Jeff Spitler, Ph.D., P.E., Member, Oklahoma State University, Stillwater, OK; Carl D. Orio, Member, and Carl N. Johnson, Ph.D., Member, Water Energy Distributors, Inc., Atkinson, NH

Symposium KC-03-04

Experimental Measurement and Numerical Modeling of Airflows

Sponsor: TC 04.10 Indoor Environmental Modeling; 05.03
APC Liaison: Don C. Hardin, Enviromatic Systems, Ft. Worth, TX
Chair: Mohammad H. Hosni, Ph.D., Member, Kansas State University, Manhattan, KS

This symposium deals with experimental measurements and numerical modeling of airflow. Both indoor and outdoor airflow are considered. New measurement techniques and numerical methodologies are addressed.

1. Performance Test Results for an Innovative Large Coupled Indoor/Outdoor Environmental Simulator (C-I/O-ES)
Terry Herrmann, P.E., FitzPatrick Nuclear Power Plant, Lycoming, NY

2. Using Large Eddy Simulation to Study Airflows in and around Buildings
Qingyan Chen, Ph.D., Member, Purdue University, West Lafayette, IN; Yi Jiang, Member, and Su Mingde, MIT, Cambridge, MA

3. Flow Characteristics of a Local Exhaust System
Walid Chakroun, Ph.D., Member, Mir Mujtaba A Quadri, Kuwait University, Safat, Kuwait

4. Development of a Stereoscopic Particle Image Velocimetry System for Full-Scale Room Airflow Studies. Part II: Validation of Algorithms
Yigang Sun, Ph.D., Member, and Yuanhui Zhang, Ph.D., P.E., Member, University of Illinois at Urbana-Champagne, Urbana, IL

5. Comparison of Air Exchange Efficiency and Contaminant Removal Effectiveness as IAQ Indices (4663)
Atila Novoselac, Student Member, and Jelena Srebric, Ph.D., Member, The Pennsylvania State University, University Park, PA

Symposium KC-03-05

Hybrid and Waste-Heat Driven Desiccant Systems

Sponsor: TC 03.05 Desiccant and Sorption Technology
APC Liaison: Frederick W. Betz, P.E., A M Kinney, Cincinnati, OH
Chair: Edward A. Vineyard, P.E., Member, Oak Ridge National Laboratory, Oak Ridge, TN

This symposium presents performance data for desiccant systems utilizing waste heat from other sources to regenerate the desiccant wheel. The symposium also includes an investigation of various desiccant system configurations and control approaches and their impact on annual operating costs.

1. An Hourly Building Simulation Tool to Evaluate Hybrid Desiccant System Configuration Options
Hugh I. Henderson, P.E., Member, CDH Energy Corporation, Cazenovia, NY; James R. Sand, Member, Oak Ridge National Laboratory, Oak Ridge, TN

2. Baseline and IES Performance of a Direct-Fired Desiccant Dehumidification Unit under Various Environmental Conditions
Andrei Y. Petrov, Ph.D., Abdolreza Zaltash, Ph.D., Edward A. Vineyard, P.E., Member, Solomon D. Labinov, Ph.D., D. Tom Rizy, and Randall L. Linkous, Ph.D., Oak Ridge National Laboratory, Oak Ridge, TN

3. Performance Comparison of Waste-Heat Driven Desiccant Systems

Matthew Cowie, Xiaohong Liao, and Reinhard Radermacher, Ph.D., Member, University of Maryland, College Park, MD

Seminar 7

Commissioning Safety Systems

Sponsor: TC 09.09 Building Commissioning
APC Liaison: Jeff J. Traylor, PWI Consulting Engineers, Durham, NC
Chair: Carl N. Lawson, Member, PWI Consulting Engineers, Durham, NC

Safety systems in facilities today are taking on an extremely high priority and the commissioning of these particular systems has become an even larger chore. In commissioning safety systems, we are advising the owner that all of these systems are safe and designed to meeting the owner's requirements for his facility, as well as being user friendly.

1. Commissioning Fire Alarm Systems
Rodney Lewis, P.E., Fellow, Rodney H. Lewis Associates, Houston, TX

2. Commissioning of Smoke Exhaust and Pressurization Systems
Gerald Kettler, P.E., Member, Air Engineering and Testing, Dallas, TX

3. Commissioning Emergency Power Systems
Jeff Traylor, Member, PWI Consulting Engineers, Durham, NC

Seminar 8

Impacts of Duct Systems on IAQ

Sponsor: TC 06.03 Central Forced Air Heating and Cooling Systems
APC Liaison: John B. Bisset, P.Eng., Chorley & Bisset, Ltd., London, ON, Canada
Chair: Jeffrey A. Siegel, Ph.D., Member, UT Austin, Austin, TX

Ducts and duct failures can have a profound impact on indoor air quality. Pollutants including radon progeny, combustion byproducts, moisture, volatile organic compounds and particulate matter are transported from buffer spaces (attics, crawlspaces, garages) and from outside into buildings through ducts. Ducts can also serve as a source of pollutants from chemistry on duct surfaces. This seminar explores some impacts of ducts on indoor air quality.

1. Duct Leakage as a Mechanism for Pollutant Transport
Paul Francisco, Member, Ecotope Inc., Seattle, WA

2. Ducts, Surface Chemistry, and Odor
Glenn Morrison, Ph.D., University of Missouri-Rolla, Rolla, MO

3. Particle Deposition in Ventilation Ducts
Mark Sippola, Ph.D., Lawrence Berkeley National Laboratory, Berkeley, CA

4. Mold: Colonization and Transport in Duct Systems
Linda Stetzenbach, Ph.D., Member, Harry Reid Center for Environmental Studies, Las Vegas, NV

5. Condensation and Positive/Negative Pressures
Joseph Lstiburek, Ph.D., Member, P. Eng, Building Science Corporation, Westford, MA

Seminar 9

Load Calculations: The Big Picture

Sponsor: TC 04.01 Load Calculation Data and Procedures
APC Liaison: Ronald L. Shelton, P.E., Oak Ridge National Laboratory, Oak Ridge, TN
Chair: Glenn Friedman, P.E., Member, P. Eng, Taylor Engineering, Alameda, CA

This seminar reviews current load calculation techniques and limitations and addresses the future of load calcautions.

1. Current Load Calculation Technology: Heat Balance
Curtis O. Pedersen, Ph.D., Fellow, Life, University of Illinois, Hastings, MN

2. Current Load Calculation Technology: Radiant Time Series
Steven Bruning, P.E., Fellow, Newcomb & Boyd, Atlanta, GA

3. Loads: The Steps to Get to the Plant
Gary Wingfield, P.E., Member, P. Eng, The Haskell Co, Jacksonville, FL

4. Loads: Looking Forward, What is Really Important
Christopher Wilkins, P.E., Member, P. Eng, Hallam Engineering, South Burlington, VT

Seminar 10

Test Methods and Classification of Refrigerant Flammability (Standard 34)

Sponsor: TC 03.01 Refrigerants and Secondary Coolants; SSPC34
APC Liaison: Daniel J. Dettmers, University of Wisconsin, Madison, WI
Chair: Sonny G. Sundaresan, P.E., Fellow, Copeland Corporation, Sidney, OH

Due to ozone hole depletion and global warming issues and associated Montreal/Kyoto protocols, environmentally friendly and energy efficient refrigerants are undergoing closer scrutiny in terms of GWP and flammability. Refrigerants are single chemical compounds or mixtures; some mixtures are nonazeotropic and may fractionate. Flammability, toxicity and nomenclature aspects of new refrigerant candidates are of immense interest to the ASHRAE audience. This seminar presents an update on flammability, fractionation and associated topics such as RCL of interest to SSPC 34 users and developers of international standards.

1. Safety Classification of Refrigerant Flammability
James M. Calm, P.E., Fellow, Engineering Consultant, Great Falls, VA

2. Burning Velocity as an Additional Criterion for Flammability Classification of Refrigerants
Denis Clodic, Ph.D., Member, Ecole De Mines de Paris, Paris, France

3. On the Relationship Between Burning Velocity and RF-Number
Shigeo Kondo, Ph.D., National Institute of Advanced Industrial Science and Technology, Tsukuba, Ibaraki, Japan

4. Issue and Solutions of Refrigerant Flammability Indices
Osami Kataoka, Ph.D., Member, Daikin Industries, LTD, Kitaku, Osaka, Japan

5. Standard 34: Refrigerant Designation and Safety Classification-Submission Requirements
Steven R. Szymurski, Member, Air-Conditioning and Refrigeration Institute, Arlington, VA

Seminar 11

What Are the Real Costs and Real Benefits of Air-to-Air Energy Recovery?

Sponsor: TC 05.05 Air-to-Air Energy Recovery
APC Liaison: Wayne Frazell, P.E., Ft. Worth, TX
Chair: Bert G. Phillips, Member, P. Eng, UNIES Ltd., Winnipeg, MB, Canada

The cost of installing air-to-air energy recovery systems is often calculated without accounting for costs savings from downsizing heating and air-conditioning equipment. When these avoided costs are considered, air-to-air energy recovery is often a low-cost or no-cost energy saving measure. Conversely, inappropriate application of air-to-air energy recovery (e.g., using sensible rather than total heat recovery in hot humid applications or not downsizing air-conditioning) may create problems without providing anticipated benefits. Speakers present case studies demonstrating costs and benefits.

1. High Enthalpic Fixed Plate Membrane ERV Cores
Colleen Smith, P.E., Member, Dais-Analytic Corporation, Odessa, FL

2. The Building That Did Not Understand ASHRAE Standard 62
Klas C. Haglid, P.E., Member, Haglid Engineers & Associates, Inc., Wyckoff, NJ

3. Mixed Air Systems: Does Adding Energy Recovery Mean Adding Another Unit?
Ronnie Moffitt, P.E., Member, The Trane Co., Lexington, KY

4. Heat Pipe Indirect/Direct Evaporative Cooling with Evaporative Cooled Condensing: The Wet Bulb Triple Dip
C. Mike Scofield, P.E., Fellow, Conservation Mechanical Systems, Sebastopol, CA

5. Air-to-Air Energy Recovery Energy Cost Savings With Dedicated Outside Air Systems
Prakash Damshala, Ph.D., P.E., Member, The University of Tennessee, Chattanooga, TN

Forum 3 10:15 to 11:05 a.m.

What Is the Environmental Health Committee and What Can It Do for You?

Sponsor: Environmental Health Committee
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Moderator: Bjarne W. Olesen, Ph.D., Fellow, Wirsbo-Wirsbo-VELTAGmbH&Co. KG, Norder-stedt, Germany

The Environmental Health Committee is a general standing committee and operates under the direction of the Board of Directors and Technology Council. EHC serves as the coordinator (or, if necessary, the provider) of expertise in the health sciences, both from within and outside the Society membership. EHC reviews, coordinates and initiates ASHRAE research in areas relating to environmental health and indoor air quality and ensures that ASHRAE members are provided with opportunities to keep themselves adequately informed on environmental health issues of interest to the Society. Is EHC living up to these goals?

Forum 4 11:15 a.m. to 12:05 p.m.

What's Needed in an ETS Design Guide?

Sponsor: TC 04.03 Ventilation Requirements and Infiltration
APC Liaison: Carl N. Lawson, PWI Consulting Engineers, Durham, NC
Moderator: Brian A Rock, Ph.D., P.E., Member, The University of Kansas, Lawrence, KS

The ASHRAE Board of Directors has decided that Standard 62 will not address environmental tobacco smoke (ETS), but that ASHRAE will develop a stand-alone publication on ETS design issues. This forum allows interested parties to discuss what should be presented in this design guide with the author, the review committee and others present.

SUNDAY 6/29 1 to 3 p.m.

Technical Session 1

Refrigerants and Heat Pumps

APC Liaison: Daniel J. Dettmers, University of Wisconsin Madison, Madison, WI

A Review of Experimental Investigations of Absorption of Water Vapor in Liquid Films Falling Over Horizontal Tubes (HVAC&R Research Journal, April 2003)
Srinivas Garimella, Ph.D., Member, Iowa State University, Ames, IA

Falling-film absorbers employing internally cooled, horizontal tubes are widely used in absorption heat pumps that employ water as the refrigerant and, for example, lithium bromide as the absorbent. Literature contains a significant amount of data from experimental investigations into such systems, but there is much to be understood. This paper presents a review of the literature containing experimental results from falling-film absorption of water vapor on horizontal tubes. Attempting to utilize results found in literature for design optimization reveals that the effects of many of these parameters are not quantified and so areas and methods for further research are suggested.

A Study of a Natural Convection Immersed Condenser Heat Pump Water Heater (4628)

Ronald E. Domitrovic, Member, University of Tennessee, Knoxville, TN; Vince C. Mei, Ph.D., P.E., Battelle, Inc., Oak Ridge, TN; Fang C. Chen, Ph.D., P.E., Member, Oak Ridge National Laboratory, Oak Ridge, TN; Joe K. Kilpatrick, Member, Tennessee Valley Authority, Chattanooga, TN; and Julia A. Carter, Oak Ridge National Laboratory, Knoxville, TN

The study reports the finding of an energy efficient heat pump water heater with no water pump. The condenser was directly inserted into the tank for water heating purposes. An experimental setup of a direct exchange vapor compression heat pump water heater was used to test and characterize several immersed condenser styles in a simulated domestic water heater. The condensers were of two primary designs: bayonet style with annular flow and U-tube style. A nominal 1-ton heat pump was affixed to an insulated 55-gallon water tank in such a way that the condenser could be easily changed.

Effect of Airflow Maldistribution on Pressure Drop and Thermal Performance of Heat Exchangers in Residential Heat Pump Systems (4629)

Amgad Elgowainy, Ph.D., P.E., Member, Purdue University Calumet, Highland, IN

The effect of nonuniform airflow distribution on the thermal performance of tube-fin heat exchangers in typical outdoor units of residential air-conditioning and heat pump systems was investigated numerically. The impact of the airflow nonuniformity on the pressure drop and fan-motor power requirement also was studied. A three-dimensional model was developed to predict the airflow distribution over the face of the heat exchanger.

Performance Analysis of Axial Fans in Residential Heat Pump Systems (4630)

Amgad Elgowainy, Ph.D., P.E., Member, Daniel Feinstein, and Ismael Rodriguez, Purdue University Calumet, Highland, IN

The design and performance of axial fan blades in unitary air-conditioning systems are investigated numerically. The effect of propeller diameter, number of blades, and blade pitch (angle of attack) on the airflow rate, static pressure rise, and static efficiency are examined by solving the full three-dimensional flow equations across the fan blade. The results show that the best performance of the propeller occurs at the maximum possible diameter, within the physical constraint of the unit, using the least number of blades at the optimum pitch range.

Symposium KC-03-06

Radiant Cooling/Heating: Demonstration and Simulation

Sponsor: TC 06.05 Radiant Space Heating and Cooling; TC 6.4
APC Liaison: Michael R. Brambley, Ph.D., Pacific Northwest National Laboratory, Richland, WA
Chair: Richard Watson, Member, SSHC, Inc., Old Saybrook, CT

The advancement of radiant technology requires the designer's ability to predict radiant system performance in the design stages and compare it with other competing systems. This symposium presents the results of ASHRAE research to obtain performance data for a residence that employs radiant heating/cooling in ceiling and floor along with a convective system. This data will be used to validate energy simulation programs currently under development. The demonstration project and its performance are described. Other papers show results of attempts to simulate the actual performance of the same facility with existing software.

1. Data Set for Validating Simulation Tools for Radiant/Convective Systems (RP-1140)

David G. Scheatzle, Ph.D., P.E., Life Member, Arizona State University, Tempe, AZ

2. Passive Performance of a High Mass Residence: Actual Data vs. EnergyPlus Simulation.

Vinay Ghatti, Member, The Weidt Group, Minnetonka, MN; David Scheatzle, Ph.D., P.E., Life Member, Addison Marlin, and Harvey Bryan, Ph.D., Arizona State University, Tempe, AZ

3. A Radiant Residence: Actual Performance and Simulation Results (RP-1140)

Xin He, Member, Ernst & Young LLP, New York, NY; and David Scheatzle, Ph.D., P.E., Life Member, Arizona State University, Tempe, AZ

4. Experimental Validation of the EnergyPlus Low Temperature Radiant Simulation

Chanvit Chantrasrisalai, Student, Oklahoma State University, Stillwater, OK; Vinay Ghatti, Arizona State University, Tempe, AZ; Daniel E. Fisher, Ph.D., P.E., Member, Oklahoma State University, Stillwater, OK; David Scheatzle, Ph.D., P.E., Life Member, Arizona State University, Tempe, AZ

Seminar 12

First Time at an ASHRAE Meeting? This Seminar's for You!

Sponsor: ASHRAE Program Committee
Chair: Kirk Mescher, P.E., Member, CM Engineering, Columbia, MO

This seminar introduces new meeting attendees to the events of a Society meeting - how to get involved in a technical committee, the difference between a symposium and a seminar, and how to become part of the meeting program. The role of ASHRAE staff in a meeting and the events that surround the AHR Exposition are explained. And if you're not having fun yet, the technical tours, guest and "special" events (how to have fun at ASHRAE) are discussed.

1. Membership: How to Get the Most Out of an ASHRAE Meeting and Exposition

John Bisset, Member, P.Eng., Chorley and Bisset, Ltd., London, ON, Canada

2. Standing Committees: What They Do and How Members are Appointed
Joy Altwies, Member, Farnworth Group Inc., Madison, WI

3. Technical Committees, Technical Programs
Charles (Wayne) Frazell, P.E., Member, Fort Worth, TX

4. The Fun Side of ASHRAE Meetings
Kenneth Clark, P.E., Member, Burns & McDonnell, Kansas City, MO

Seminar 13

Applications and Components of Life-Cycle Costing

Sponsor: TC 01.08 Owning and Operating Costs
APC Liaison: Frederick W. Betz, P.E., A. M. Kinney
Chair: Michaela Martin, P.E., Member, Oak Ridge National Laboratory, Oak Ridge, TN

This seminar includes four presentations on various components and applications of life-cycle costing: introduction to life-cost analysis; results from a life-cycle cost study of energy projects at federal facilities; a practical approach to helping federal agencies apply life-cycle cost-effectiveness criterion in widely varying circumstances — ranging from small purchases to larger competitive acquisitions; and the use of utility rate analysis tools and techniques to inform equipment choice decisions and operational measures based on real costs of energy.

1. Introduction to Life-Cycle Cost Analysis
Billy B. Wise, Southern Company Energy Solutions, Atlanta, GA

2. Life-Cycle Cost Analysis of Federal Energy Projects: Financing vs. Direct Funding
John A. Shonder, Member, Oak Ridge National Laboratory, Oak Ridge, TN

3. Energy-Efficient Federal Purchasing: The Role of Life-Cycle Cost Analysis
Jeffrey Harris, Lawrence Berkeley National Laboratory, Washington D.C.

4. Utility Rate Analysis Tools and Techniques
Wayne Robertson, P.E., Member, Energy Ace, Inc., Decatur, GA

Seminar 14

Avoiding IAQ Problems with Evaporative Cooling

Sponsor: TC 05.07 Evaporative Cooling
APC Liaison: Don C. Hardin, Enviromatic Systems, Ft. Worth, TX
Chair: Leon E. Shapiro, Member, J. D., ADA Systems, Wood Dale, IL

Indoor air quality (IAQ) issues for commercial, institutional, health care and industrial facilities have become a major concern for many ASHRAE members. Evaporative cooling technologies and design strategies incorporating evaporative cooling components can be effectively used to remediate and/or prevent many of the IAQ problems these buildings often incur. This seminar focuses on why evaporative cooling systems have a positive affect on IAQ, and how evaporative cooling systems can be designed and maintained to insure they will not contribute to IAQ problems.

1. Misconceptions About Evaporative Coolers
Patricia T. Graef, P.E., Member, Munters Corporation, Fort Myers, FL

2. IAQ Design Considerations for Evaporatively Cooled Schools
Daniel E. Harmeyer, P.E., Member, P. Eng, Harmeyer Nellos Engineering, Inc., Albuquerque, NM

3. Why Maintenance Departments Choose NOT to Maintain and Operate their Evaporative Cooling Components In Large Laboratory Systems
Douglas Guinn, P.E., Member, Bridgers & Paxton Consulting Engineers, Inc., Albuquerque, NM

4. Automating Direct Evaporative Cooling Systems to Minimize Maintenance Requirements
Mark S. Lentz, P.E., Member, Lentz Engineering Associates, Inc., Sheybogan Falls, WI

Seminar 15

Controlling Noise From Terminal Boxes

Sponsor: TC 02.06 Sound and Vibration Control
APC Liaison: Carl N. Lawson, PWI Consulting Engineers, Durham, NC
Chair: Jason D. Swan, Associate, Cerami & Associates, New York, NY

Careful consideration is needed when specifying and placing terminal boxes, such as VAV, mixing or fan-powered boxes, to avoid noise problems. This seminar, part of a series by TC 2.6 on equipment noise, discusses how terminal boxes make noise, including the fundamental differences between types of boxes. It addresses laboratory testing of terminal boxes and the governing standards, how their noise is reported, how they are specified, how they are tested in the field to determine compliance, and what can be done to improve noise levels after installation.

1. Air Terminal Units Can Be Quiet
Ted N. Carnes, Ph.D., P.E., Associate, Pelton Marsh Kinsella, Dallas, TX

2. Comparison of Room Noise Control for Series and Parallel VAV Terminal Units at Different Operating Conditions
Eugene W. Faris, Associate, Nailor Industries, Inc., Houston, TX

3. Specifying Terminal Boxes
Dan Int-Hout III, Member, Krueger, Richardson, TX

4. Field Testing Concerns of Terminal Units
Gaylon Richardson, Fellow, Engineered Air Balance Company, Houston, TX

Seminar 16

Emerging Technologies in the Refrigeration Industry

Sponsor: TC 10.01 Custom Engineered Refrigeration Systems
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Chair: Bruce L. Griffith, Associate, York Refrigeration - Frick, Waynesboro, PA

There are growing concerns with refrigerant effects on the environment and energy consumption within the industrial refrigeration industry. This seminar focuses on new developments and applications within the industry that could help reduce the effects on energy and the environment.

1. Ammonia and Carbon Dioxide Cascade Systems
Charles R. Taylor, P.E., Associate, P. Eng, The Stellar Group, Jacksonville, FL

2. Recent Developments In Mixed Gas Refrigeration
Martin L. Timm, P.E., Member, Praxair, Inc., Tonawanda, NY

3. Large Scale Thermoacoustic Refrigeration Systems
Bayram Arman, Ph.D., Praxair, Inc., Tonawanda, NY

4. Sub-Zero Thermal Energy Storage for Process Cooling
Christian Lenotre, Ph.D., Cristopia Thermal Energy Storage, Inc., San Dimas, CA

5. Use of Solid Carbon Dioxide Refrigerant in Convention Evaporator Coils
Matthew Otonicar, FMC Food Tech, Redmond, WA

Forum 5 1 to 1:50 p.m.

Should ASHRAE Develop a Method of Test Standard for Rating Compressors that Operate on Supercritical Refrigerants?

Sponsor: TC 08.01 Positive Displacement Compressors
APC Liaison: Arthur P. Garbarino, Air Service Inc., West Palm Beach, FL
Moderator: Richard L. Hall, P.E., Member, Battelle, Columbus, OH

The scope of Standard 23, Method of Testing for Rating Positive Displacement Compressors and Condensing Units, is being revised to more precisely reflect the application limits for this test methodology. Specifically, this test methodology does not apply to supercritical refrigerants such as CO_2. Should ASHRAE create a new standard for rating CO_2 compressor products that will soon be commercialized?

Forum 6 2 to 2:50 p.m.

Are There Problems Applying the New IBC Seismic Requirements?

Sponsor: TC 02.07 Seismic and Wind Restraint Design
APC Liaison: Arthur P. Garbarino, Air Service Inc., West Palm Beach, FL
Moderator: James A. Carlson, Associate, P. Eng, Omaha Public Power District, Springfield, NE

The recently published International Building Code and National Fire Protection Association (NFPA) Building Code is changing minimum requirements with respect to seismic issues associated with non-structural components. TC 2.7 noticed that many professionals have been looking for guidance in design and installation of seismic restraints to meet these code requirements. The 1999 ASHRAE publication, "A Practical Guide for Seismic Restraint" is very popular. What are the current practical application issues experienced by the membership as they apply the IBC?

MONDAY, 6/30 8 to 10 a.m.

Technical Session 2

Ventilation Issues

APC Liaison: Ronald L. Shelton, P.E., Oak Ridge National Laboratory, Oak Ridge, TN

CFD Analysis of Ventilation System Performance for Enclosed Parking Garages (4631)
A. Ayari, Ph.D., and Moncef Krarti, P.E., University of Colorado, Boulder, CO

This paper presents a CFD analysis of airflow and contaminant distribution within enclosed vehicular parking facilities. First, the CFD simulation is validated using field data. Then, the results of a parametric CFD analysis are summarized. It was found that significant fan energy savings can be obtained when simple on-off controls are properly implemented without affecting the indoor air quality within the garage. The position of the exhaust fans relative to the supply fans can be crucial to ensure high effectiveness of the ventilation system.

Energy Efficient Single Stack Exhaust Fan Systems (4632)
Minsheng Liu, Ph.D., P.E., and Gang Wang, University of Nebraska Lincoln, Omaha, NE

The conventional "constant air volume" exhaust fan system is a variable air volume system. The fan airflow increases as the fume hood airflow decreases. Two energy efficiency measures were developed to reduce the fan power of the conventional constant air volume exhaust system. In the first, a modulation damper is added in the main exhaust air duct and a static pressure sensor at the inlet or outlet of the exhaust air fan. The second consists of adding a variable frequency drive to the fan motor and a static pressure sensor to the outlet of the fan.

Improve Energy and Comfort Performance of Large Office Buildings Using Integrated Interior and Exterior Zone Air-Handling Units (4633)

Li Song and Mingsheng Liu, Ph.D., P.E., Member, University of Nebraska Lincoln, Omaha, NE

The interior zone and exterior zone air-handling units (AHU) can be connected through their return air ducts to become a new air-handling unit system, the OAHU system, which allows optimal choice of outside air intake and decouples sensible and latent cooling in a zone with lower sensible load. This minimum system modification reduces the building thermal energy consumption and improves indoor air quality in the zone of higher load.

Measured Performance of Conventional and High-Velocity Distribution Systems in Attic and Space Locations (4634)

Edward A. Vineyard, P.E., Member, Randall L. Linkous, and Evelyn Baskin, Ph.D., Member, Oak Ridge National Laboratory, Oak Ridge, TN

Residential distribution systems are inefficient at delivering heated or cooled air to the conditioned space as the result of poor design and installation practices. This can result in increased energy consumption, poor thermal comfort and high peak electricity demand. Efforts to improve distribution systems could result in substantial energy savings since some 50 percent of existing homes have ducted systems. To quantify potential energy savings resulting from the elimination of duct losses, a field test was conducted to compare the energy consumption of an attic-ducted system to a no-loss duct system for two types of forced-air distribution systems: conventional and high-velocity.

Seminar 17

Advances in Secondary Coolants

Sponsor: TC 03.01 Refrigerants and Secondary Coolants
APC Liaison: Charles (Wayne) Frazell, P.E., Carmel, IN
Chair: Kevin C. Connor, Member, The Dow Chemical Company, Midland, MI

Secondary coolants are used in a wide variety of heating and cooling applications. From freeze immersion of foods to residential or commercial heating, a high demand is placed on the versatility of the fluid. Indeed no single type of secondary coolant achieves best in class performance for all possible applications and so trade-offs in heat transfer efficiency, corrosion protection, toxicity, freeze protection and cost are both necessary and inevitable. This seminar reviews the experiences and compares the limitations of various secondary coolants used in a number of conventional HVAC applications.

1. Comparison of Secondary Loop Systems Using either Potassium Acetate or CO_2

Denis F. Clodic, Ph.D., Member, Ecoles Des Mines Des Paris, Paris, France

2. Aqueous Secondary Coolant Used as a Low Temperature Heat Transfer Fluid and As a Thermal Energy Storage Medium in Large Cooling Systems

John S. Andrepont, P.E., Member, The Cool Solutions Company, Naperville, IL

3. A Review of Secondary Coolants and Compatibility with Common Materials of Construction within the HVAC Industry

Kevin C. Connor, Member, The Dow Chemical Company, Midland, MI

Seminar 18

Establishing Cost Effective Energy Baselines for Measurement and Verification

Sponsor: TC 01.05 Computer Applications
APC Liaison: Jeff J. Traylor, PWI Consulting Engineers, Durham, NC
Chair: Pornsak Songkakul, Member, D.Eng., Siemens Building Technologies, Inc., Buffalo Grove, IL

Measurement and verification (M&V) are key factors in determining the effectiveness of any energy conservation measure and retrofit program. Practitioners need to strike a balance between technical sufficiency and verification expense. Seminar topics include the use of computer applications for establishment of the energy consumption baseline for a major boiler retrofit; development of M&V plan and energy baseline for a large army installation project; tools for cost effectively measuring and verifying the energy saving benefits of common air conditioning service tasks; and confirming bottom line performance through the installation of intelligent metering system.

1. Setting the Energy Consumption Baseline for Fairchild AFB for a Major Boiler Retrofit

Charles H. Culp, Ph.D., P.E., Member, Texas A&M University, College Station, TX

2. Developing an M&V Plan and Baseline for the Ft. Hood ESPC Project

Jeff S. Haberl, Ph.D., P.E., Member, Texas A&M University, College Station, TX

3. Estimating Efficiency and Establishing Baselines for Verifying the Energy Saving Benefits Associated With Servicing Air Conditioners

Todd M. Rossi, Ph.D., Member, Field Diagnostics Services Inc., Langhorne, PA

4. Performance Contracting Diagnostics (Confirming Bottom Line Performance)

Wayne A. Dunn, P.E., Member, Sunbelt Engineering Inc., Jacksonville, FL

Seminar 19

How Do Building Codes Impact Control Systems?

Sponsor: TC 01.04 Control Theory and Application

APC Liaison: Don C. Hardin, Enviromatic Systems, Ft. Worth, TX
Chair: Dave Kahn, P.E., Member, RMH Group, Lakewood, CO

Building codes are adopted by governmental jurisdictions to establish minimum standards for construction. The codes are adopted to protect the public. Design engineers and contractors need to be aware of codes and standards that regulate their work. BOCA, ICBO and SBCCI have recently merged to form the International Code Council, which publishes the International Codes. The new International Code family consisting of Building, Mechanical, Fire, and Energy codes have many requirements that directly affect the design and installation of HVAC controls. Additionally, the industry is held to a standard of care defined by ASHRAE standards.

1. ASHRAE Standard 90.1 Control Requirements
Steve Taylor, P.E., Member, Taylor Engineering, Alameda, CA

2. UL 863 for DDC Control Systems
Paul Ehrlich, P.E., Member, The Trane Company, St. Paul, MN

3. ASHRAE Standard 62 Control Requirements
Dennis A Stanke, Member, The Trane Co., La Crosse, WI

4. Building Codes and Controls: What Are the Requirements?
David Kahn, P.E., Member, RMH Group, Lakewood, CO

Seminar 20

Mold in the HVAC&R Industry

Sponsor: Environmental Health Committee
APC Liaison: John B. Bisset, P.Eng., Chorley & Bisset, Ltd., London, ON, Canada
Chair: Raymond E. Patenaude, P.E., Member, The Holmes Agency, Inc., St. Petersburg, FL

Mold is impacting all facets of the building industry. Building occupants are concerned about the health impacts, litigation is increasing at an alarming rate, and Federal and State regulatory agencies are concerned about mold in the indoor environment. This seminar addresses the various HVAC&R societies' and industry groups' positions on mold in the HVAC&R industry. Representatives from ASHRAE, MCAA, NEBB, SMACNA, CIBSE and RSES provide short position statements followed by a question and answer session.

Seminar 21

Smoke Management Provisions of the ICC and NFPA Building Codes: How Do They Stack Up?

Sponsor: TC 05.06 Control of Fire and Smoke; TC 09.08 Large Building Air-Conditioning Applications
APC Liaison: Joy Altwies, Farnsworth Group, Inc., Madison, WI
Chair: William A. Webb, P.E., Fellow, Performance Technology Consulting, Ltd., Lake Bluff, IL

The International Code Council publishes the International Building Code that replaces the three model building codes. The ICC recently completed and published the ICC Performance Code for Buildings and Facilities. For the first time the National Fire Protection Association has prepared a building code, NFPA 5000-2002. Each of the codes has smoke management provisions. The seminar presents a brief history of how the topic developed in the model codes and the differences and similarities in the provisions of current versions of the ICC and the NFPA codes.

1. Background of Three Model Codes
James R. Quiter, P.E., Arup Fire, San Francisco, CA

2. Smoke Management Provisions of the IBC
Sanjay Aggarwal, P.E., Member, Rolf Jensen & Associates, Inc., Walnut Creek, CA

3. Smoke Management Provisions of the NFPA Codes
John R. McCormick, P.E., Code Consultants Incorporated, St. Louis, MO

4. Smoke Management Provisions of the ICC Performance Code
Beth Tubbs, P.E., International Conference of Building Officials, Northbridge, MA

Seminar 22

Variable Flow Through Centrifugal Chillers

Sponsor: TC 08.02 Centrifugal Machines; TC 8.11 - Electric Motors and Motor Control
APC Liaison: Frederick W. Betz, P.E., A.M. Kinney, Cincinnati, OH
Chair: Fred W Betz, P.E., Member, A.M. Kinney,Inc, Cincinnati, OH

This seminar covers several aspects of variable flow through chillers including variable speed compressor motor control and variable flow system advantages and experience. Results of a survey of owners, designers, and manufacturers about these systems are presented. A case study of a central system addressing the decision to not use variable primary flow is presented. Other aspects of these systems are addressed too.

1. Designer, Owner and Manufacturer Views of Variable Primary Flow Chilled Water Systems
William P. Bahnfleth, Ph.D., P.E., Member, Pennsylvania State University, University Park, PA

2. Why University of Illinois Did Not Convert to Variable Primary Flow
David M. Green, Member, University of Illinois, Champaign, IL

3. Practical Experience from Over 300 Variable Primary Systems
Terry J. Moses, Member, Systecon Inc., West Chester, OH

4. Experiences in Variable Speed Control of Centrifugal Chillers

Ivan Jadric, Member, York International Corp., York, PA

Forum 7 8 to 8:50 a.m.

Ventilation of Health Care Facilities

Sponsor: TC 09.08 Large Building Air-Conditioning Applications
APC Liaison: Kenneth M. Clark, P.E., Burns & McDonnell, Kansas City, MO
Moderator: Richard Hermans, P.E., Member, Center for Energy & Environment, Minneapolis, MN

This forum is an update on the status of SPC-170P, Ventilation of Health Care Facilities, and a request for input on issues.

Forum 8 8 to 8:50 a.m.

What Could Stop Me from Installing My Distributed Generation System?

Sponsor: TC 09.05 Cogeneration Systems
APC Liaison: Michael R. Brambley, Ph.D., Pacific Northwest National Laboratory, Richland, WA
Moderator: James H. Watts, Member, Ingersoll Rand, Reading, MA

The regulatory environment for distributed generation is changing, especially in the areas of emissions and electrical interconnection. This forum explores and discusses the current status of these and similar areas.

Forum 9 9 to 9:50 a.m.

IAQ Needs in Humid Environments

Sponsor: TC 02.03 Gaseous Air Contaminants and Gas Contaminant Removal Equipment
APC Liaison: Michael R. Brambley, Ph.D., Pacific Northwest National Laboratory, Richland, WA
Moderator: Charlene W. Bayer, Ph.D., Member, Georgia Tech Research Institute, Atlanta, GA

Mold issues are quickly becoming the "asbestos" of the 21st century, and a variety of companies are jumping on the "mold bandwagon." Mold lawsuits are proliferating. We know that mold in buildings results in significant numbers of health complaints. Yet in many cases the actual medical connections have not been made. What are the best solutions for moisture control? What are the optimum ventilation methods to tightly control indoor space humidity levels, and do the methods change for different climates? What about air cleaners, UVGI, and other technologies being touted as solutions?

Forum 10 9 to 9:50 a.m.

Is it Possible or Practical to Recover Energy from Kitchen Hood Exhaust?

Sponsor: TC 05.05 Air-to-Air Energy Recovery; TC 5.10
APC Liaison: Kenneth M. Clark, P.E., Burns & McDonnell, Kansas City, MO
Moderator: Donald R. Fisher, Associate, P. Eng, Fisher-Nickel, inc., San Ramon, CA

Energy recovery from kitchen exhaust is not common despite its attractiveness for heating the makeup air and/or domestic water. The grease-laden characteristic of exhaust from cooking presents a technical and a local code challenge for the installation of energy recovery equipment. Although one manufacturer of kitchen ventilation equipment developed a heat recovery module, successful installations have not been documented. Similarly, engineered systems have been anecdotally reported for institutional kitchens in northern climate zones. Feedback from the design community on the potential for heat recovery from kitchen exhaust systems and the role of ASHRAE is sought.

MONDAY, 6/30 10:15 a.m. to 12:15 p.m.

Symposium KC-03-07

Developments in Radiant Cooling

Sponsor: TC 06.05 Radiant Space Heating and Cooling
APC Liaison: Timothy J. McGinn, P.Eng., Keen Engineering Co., Ltd., Calgary, AB, Canada
Chair: David G. Scheatzle, Ph.D., P.E., Life Member, Arizona State University, Tempe, AZ

Increasing interest is shown in radiant cooling technology as advantages are realized for comfort, indoor air quality and energy efficiencies, and as products and simulation programs are developed. This symposium presents current work related to radiant cooling.

1. Energy Conservation Benefits of a Dedicated Outdoor Air System with Parallel Sensible Cooling by Ceiling Radiant Panels

Jae-Weon Jeong, Student Member, Stanley A. Mumma, Ph.D., P.E., Fellow, and William P. Bahnfleth, Ph.D., P.E., Member, The Pennsylvania State University, University Park, PA

2. Applications of Heating and Cooling Thermal Slabs for Different Buildings and Climates

Pierfrancesco Brunello, Ph.D., Michele. DeCarli, Ph.D., Massimo Tonon, and Roberto Zecchin, Ph.D., University of Padova, Padova, Italy

3. Investigation of a Condenser-Linked Radiant Cooling System Using a Heat Balance Based Energy Simulation Program

Richard Strand, Ph.D., Member, University of Illinois, Champaign, IL

4. New European Standard Proposal for Design and Dimensioning of Embedded Radiant Surface Heating and Cooling Systems

Bjarne W. Olesen, Ph.D., Fellow, Wirsbo-Velta GmbH & Co., Nordenstadt, Germany; Markus Koschenz, EMPA, Zurich, Switzerland; and Christer Johansson, ESBE AG, Boraas, Sweden

Symposium KC-03-08

FDD, Operation and Maintenance of HVAC Systems

Sponsor: TC 04.11 Smart Building Systems; TC 1.7, Operations and Maintenance Management
APC Liaison: Arthur P. Garbarino, Air Service Inc., West Palm Beach, FL
Chair: George E. Kelly, Ph.D., Fellow, National Institute of Standards and Technology, Gaithersburg, MD

As building HVAC systems and their controls become more and more complicated, there is a need for smarter building management systems and better user interfaces to assure proper operation. This symposium presents recent research on applying fault detection and diagnostic (FDD) methods to variable air volume boxes and package air conditioners, the development and testing of a new occupant interface to energy and maintenance systems and the design of a maintenance and operations recommended for use by building maintenance personnel.

1. Application of Control Charts for Detecting Faults in Variable-Air-Volume Boxes
Jeffrey Schein, Associate, M. D., National Institute of Standards and Technology, Gaithersburg, MD; and John M. House, Ph.D., Member, Iowa Energy Center, Ankeny, IA

2. An Improved Method for Fault Detection and Diagnosis Applied to Package Air Conditioners
Haorong Li, Student Member, M. D., and James E. Braun, Ph.D., Member, Purdue University, West Lafayette, IN

3. Design of a EMCS/CMMS User Interface for Building Occupants
Clifford C. Federspeil, Ph.D., Associate Member, and Luis Villafana, M. D., University of California, Berkeley, CA

4. Design of a Maintenance and Operations Recommender
Clifford C. Federspiel, Ph.D., Associate Member, and Luis Villafana, M.D., University of California, Berkeley, CA

Seminar 23

Back to Basics: Specifying the Right Windows for Your Job

Sponsor: TC 04.05 Fenestration
APC Liaison: Jeff J. Traylor, PWI Consulting Engineers, Durham, NC
Chair: Francois Dubrous, Member, P. Eng, Natural Resource Council Canada, Ottawa, ON, Canada

This seminar is the first of a series on basic, applied knowledge about windows and fenestration. Chapter 30 of the current Handbook, Fundamentals, offers a vast amount of information on fenestration, from which engineers need to extract specific pieces for their various jobs. Have you experienced frustration in that digging process? Then attend these back-to-basic seminars! This first one deals with low-E glass, condensation resistance, and installation of the products onsite … issues that sound familiar to practicing engineers. Your questions and issues will help frame the next seminar.

1. Reducing Solar Heat Gains in Commercial Buildings with Low-E Glass
Dariush Arasteh, P.E., Member, Lawrence Berkeley National Laboratory, Berkeley, CA

2. Window Condensation: The Evil You Can Live Without
Hakim Elmahdy, Ph.D., P.E., Member, P. Eng, National Resource Council Canada, Ottawa, ON, Canada

3. Fenestration Installation and Energy Efficiency Tips
Bipin Shah, P.E., Member, NFRC, Fairfax, VA

4. How to Get the Window Performance You Want On Site
Alex McGowan, P.E., Member, P. Eng, Levelton Engineering, Richmond, BC, Canada

Seminar 24

Control Strategies for Variable Primary Chilled Water Systems

Sponsor: TC 01.04 Control Theory and Application; TC 04.06 Building Operation Dynamics
APC Liaison: Don C. Hardin, Enviromatic Systems, Ft. Worth, TX
Chair: Frank Shadpour, P.E., Member, GEM Engineering, San Diego, CA

Variable flow primary chilled water systems have a reputation for being unreliable due to excessive chiller trips, particularly with plants that have chillers of different sizes. Applying conventional control strategies to variable primary flow systems leads to inefficiencies. This presentation discusses simple control sequences that can provide efficient yet reliable controls.

Demand based control can be applied to such systems in order to simplify them and reduce their cost of implementation. The seminar addresses the liabilities of ASHRAE members for recommending new applications similar to this.

1. Applying Demand Based Control to Variable Primary Flow
Thomas Hartman, P.E., Member, The Hartman Company, Marysville,, WA

2. Simple and Reliable Control of Variable Flow Primary Chillers Water Systems
Steven T. Taylor, P.E., Member, Taylor Engineering LLC, Alameda, CA

3. Interfacing and Equipment Limitations Associated with Variable Flow CHW Primary Systems
Jim Mangini, P.E., Member, Carrier Corporation, Charlotte, NC

4. Lessons Learned in Variable Primary Chilled Water Control
Mick Schwedler, P.E., Member, Trane, LaCrosse, WI

5. Liabilities of ASHRAE Members for Recommending New Technologies or Applications
Margaret D. Lineberry, Esq., Shook, Hardy & Bacon L.L.P., Kansas City, MO

Seminar 25

Developments in Thermal Energy Storage

Sponsor: TC 06.09 Thermal Storage
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Chair: Richard J. Kooy, P.E., Member, Chicago Bridge & Iron Company (CB&I), Plainfield, IL

Thermal energy storage (TES) can improve efficiency and reduce capital costs of air conditioning systems, while enabling facility owners/operators to better manage their electrical demand. Continued restructuring of energy markets may further increase the financial benefits for facility owners/operators to flatten or invert their daily electric demand load profile by utilizing TES. This seminar highlights some of today's successful commercial applications of TES as well as some new TES technologies and applications.

1. Debunking the TES Myths
Mark M. MacCracken, P.E., Member, Calmac Mfg. Co., Englewood, NJ

2. A New Technology of Ice Thermal Storage
Jean Patry, AIRCLIMA Research, Paris, France

3. Control of Thermal Energy Storage Systems
Christian Lenotre, Ph.D., Cristopia Thermal Energy Storage, Inc., San Dimas, CA

4. Applications and Properties of Stratified Low Temperature Fluid for Thermal Energy Storage
John S. Andrepont, Member, The Cool Solutions Company, Naperville, IL

Seminar 26

Filtration for Compliance with IAQ Procedure of Standard 62

Sponsor: TC 02.03 Gaseous Air Contaminants and Gas Contaminant Removal Equipment; TC 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment
APC Liaison: John B. Bisset, P.Eng., Chorley & Bisset, Ltd., London, ON, Canada
Chair: Christopher O. Muller, Member, Purafil, Inc., Doraville, GA

The IAQ Procedure of Standard 62 provides an alternate to the Ventilation Rate Procedure to obtain acceptable air quality indoors. This seminar presents background on the IAQ procedure and its development to its current form, discusses the particulate and gas-phase filtration system design considerations that are required, and provides a perspective on the engineering design/build aspects of applying the IAQ procedure for both retrofit and new building applications.

1. What Does Standard 62 Require: The IAQ Procedure, Filtration and Air Cleaning
Andrew Persily, Ph.D., Member, National Institute of Standards and Technology, Gaithersburg, MD

2. Beyond MERV 6: The IAQ Procedure and Particulate Filtration
Michael Montague, AAF International, Louisville, KY

3.. Gaseous Contaminant Control Requirements for the IAQ Procedure of ASHRAE Standard 62.1
W. Brad M. Stanley, Member, Purafil, Inc., Doraville, GA

4. Examples of Application of Standard 62.1's IAQ Procedure Using Air Cleaning Technologies
Scott D. Hanson, Member, Brucker Company, Elk Grove Village, IL

Seminar 27

Master Planning for Health Care

Sponsor: TC 09.08 Large Building Air-Conditioning Applications
APC Liaison: Carl N. Lawson, PWI Consulting Engineers, Durham, NC
Chair: Kimball Ferguson, P.E., Member, Duke University Medical Center, Durham, NC

Health care facility master planning is of the utmost importance. In order to properly design new facilities, the master plan should identify different aspects of the facility and the requirements, how they relate to one another and how growth and market changes may affect that growth required for master planning. With the presence of health care becoming more of an issue within our Society, it is imperative that engineers become more aware of the master planning aspect of health care facilities. Four areas of master planning are reviewed in this seminar.

1. The Planning of Health Care Facilities in Less Developed Countries: Expectation vs. Affordability
Sidney A. Parsons, P.E., Member, Arup Consulting Engineers, Cork, Ireland

2. Practical Problems and Common Deficiencies of HVAC Installations and Space Ergonomics: Their Impact on Operating Room Indoor Conditions
Constantinas A. Balaras, Ph.D., P.E., Member, National Observatory of Athens, P. Penteli, Greece

3. Master Planning for Health Care: Seven Levels of Engineering Master Planning
Michael Toth, P.E., Member, PWI Consulting Engineers, Durham, NC

4. Jamor Equipment for Master Planning
Carl N. Lawson, Member, PWI Consulting Engineers, Durham, NC

Seminar 28

TEGA Issues Update: ASHRAE's Future - A Board Level Perspective

Sponsor: Technical, Energy and Government Activities Committee

APC Liaison: Dan Dettmers, University Wisconsin, Madison, WI
Chair: Ronald Jarnagin, ASHRAE Director at Large, Battelle, Pacific NW Laboratory, Richland, WA

ASHRAE's Board of Directors utilizes strategic planning to ensure that members are working towards the same goals and assessing and adjusting the organization's direction in response to the changing environment. ASHRAE's strategic planning process helps produce decisions and actions that will shape the organization's future. The Board has recently increased its focus on ASHRAE's future by setting new strategic goals. Board members will discuss new strategic goals to bring value to members, with an emphasis on activities over the next 2-3 years.

1. ASHRAE's Current and Future Challenges
Donald Colliver, Ph.D., P.E., ASHRAE President, Fellow, University of Kentucky, Lexington, KY

2. ASHRAE's Strategic Planning Process
Kent W. Peterson, P.E., ASHRAE Vice-President, P2S Engineering Inc., Long Beach, CA

3. Listening to Input - What Have We Heard?
Ronald E. Jarnagan, ASHRAE Director at Large, Battelle, Pacific NW Laboratory, Richland, WA

4. ASHRAE's New Strategic Goals
J. Chris Edmondson, ASHRAE Director and Regional Chair, James M. Pleasants Co., Greensboro, NC

Forum 11 10:15 to 11:05 a.m.

Can You Perform Field Capacity Tests?

Sponsor: TC 09.07 Testing and Balancing
APC Liaison: Kenneth M. Clark, P.E., Burns & McDonnell, Kansas City, MO
Moderator: Gaylon Richardson, Fellow, Engineered Air Balance Co., Inc., Houston, TX

There have been concerns that field capacity tests have not been developed. The other concern is the tests used are impractical for field testing. This forum discusses requirements for field testing heat exchanger capacities related to energy used. The forum also discusses requirements in testing and balancing standards (including ASHRAE Standard 111), and other test standards. Can the ARI test standards be used in the field? Should a new guideline be developed for establishing coefficients of performance?

Forum 12 11:15 a.m. to 12:05 p.m.

What Do Engineers and Contractors Want from Residential Load Calculations?

Sponsor: TC 04.01 Load Calculation Data and Procedures
APC Liaison: Kenneth M. Clark, P.E., Burns & McDonnell, Kansas City, MO
Moderator: Charles S. Barnaby, Member, Wrightsoft Corporation, Lexington, MA

A current research project, "Updating the ASHRAE/ACCA Residential Heating and Cooling Load Calculation Procedures and Data," (1199-R) seeks to strengthen residential sizing methods. This forum seeks comment and ideas that will help that project meet the needs of the industry.

TUESDAY, 7/1 8 to 10 a.m.

Symposium KC-03-09

Integrated Cleanroom Design and Construction

Sponsor: TC 04.12 Integrated Building Design; TC 09.11 Clean Spaces
APC Liaison: Kenneth M. Clark, P.E., Burns & McDonnell, Kansas City, MO
Chair: Charlie C. Shieh, Ph.D., P.E., Member, GPM Engineering, Corpus Christi, TX

This symposium addresses the design and construction integration for cleanroom facilities, to achieve better quality, faster delivery, lower cost, optimization of operation and maintenance, lower energy consumption, cleaner environment, safer, more reliable and more productive conditions and longer service life.

1. Integrating Constructability into Cleanroom Design
Donald E. Acker, P.E., Lockwood Greene, Dallas, TX

2. Cleanroom Integration: The Architect Role
Michael Uyeda, AIA, Graeber Simmons & Cowan, Austin, TX

3. Integrating Technology Changes into Microelectronic Cleanrooms
Phil Naughton, P.E., Member, Motorola, Austin, TX

4. Cleanroom Energy Benchmarking Results
William Tschudi, P.E., Member, and Tenfang Xu, Ph.D., P.E., Lawrence Berkeley National Laboratory, Berkeley, CA

Seminar 29

Advanced Building Energy Performance Guidelines

Sponsor: TC 09.06 Systems Energy Utilization
APC Liaison: Don C. Hardin, Enviromatic Systems, Ft. Worth, TX
Chair: Harry P. Misuriello, Member, Alliance to Save Energy, Washington, D.C.

Advanced building energy performance guidelines have been implemented in new commercial construction markets in the U.S., and have resulted in design performance that exceeds baseline building energy codes by 10 to 40 percent. Sponsored by utilities and private organizations, these voluntary programs have resulted in lower operating costs than code minimums while demonstrating cost-effectiveness and capturing significant market shares of new construction. This

seminar presents examples of these advanced guideline programs in terms of program design philosophy and bottom line results.

1. Moving 28 Percent Beyond the Minnesota Building Energy Code with the Energy Assets Program
David A. Eijadi, AIA, The Weidt Group, Minnetonka, MN

2. Advanced and Cost-Effective Design Strategies from the Design 2000 Plus Program
Francis Boucher, Member, CEM, National Grid, Northboro, MA

3. Collaborative for High Performance Schools: Best Practices Manual Development and Content
Gregg D. Ander, FAIA, Southern California Edison, Irwindale, CA

4. Guiding High Performance Buildings Through California's Savings By Design Program
Janith E. Johnson, AIA, Southern California Edison, Fontana, CA

5. Progress Towards the Next Generation of Advanced Building Guidelines
Jeffrey A. Johnson, Member, New Buildings Institute, White Salmon, WA

Seminar 30

Avoiding Litigation: Engineering Solutions to HVAC Problems

Sponsor: TG1 General Legal Education
APC Liaison: Kirk T. Mescher, P.E., CM Engineering, Columbia, MO
Chair: Warren G. Hahn, P.E., Life, Hahn Engineering, Inc., Tampa, FL

This seminar focuses on how HVAC industry members can avoid litigation through engineering solutions and good dispute resolution skills. Using case studies in which HVAC problems developed after project completion, this program discusses problem solving, mediation, and other alternative methods for resolving disputes, and the engineering solutions that ultimately avoided litigation. The HVAC problems addressed include inadequate airflow caused by changed ductwork during value engineering, condensation from diffusers, design errors on a split DX VAV system that caused airflow, freezing coil, and underheating problems and severe water hammering in condenser piping.

1. Problem Solving, Mediation and Other Alternative Dispute Resolution Methods
Mark Diamond, Associate, J. D., Law Firm of Mark Diamond, Murray Hill Station, NY

2. It's Getting Warm in the Rectory
Michael J. Hahn, P.E., Member, Hahn Engineering, Inc., Tampa, FL

3. The Fire Station Was Wet, but Not from the Fire Hose
Warren G. Hahn, P.E., Life, Hahn Engineering, Inc., Tampa, FL

4. Oops! We've Made a Mistake!
Ron Bailey, P.E., Member, Bailey Engineering Corp., Jupiter, FL

5. Construction Is Finished, but the Hammering Goes On
Bill Greenlees, P.E., Member, Anston-Greenlees, Inc., Tampa, FL

Seminar 31

Control Systems for Thermal Energy Storage

Sponsor: TC 06.09 Thermal Storage
APC Liaison: Frederick W. Betz, P.E., A.M. Kinney, Cincinnati, OH
Chair: William E. Stewart, Jr., Ph.D., P.E., Member, InterMountain Research, Olathe, KS

Thermal storage designers are faced with multiple options for the control of systems. This seminar addresses some of the control strategies for both designers and operators of thermal storage systems.

1. Impact of Electricity Deregulation for Control of Chiller Plants Equipped with Thermal Energy Storage
Darrel D. Massie, Ph.D., P.E., Member, U.S. Military Academy, West Point, NY

2. Successful Control Systems for Thermal Energy Storage
Verle A. Williams, P.E., Fellow, Utility Services Unlimited, Inc., San Diego, CA

3. System Design Impacts on Partial Ice Storage Control
Brian Silvetti, P.E., Member, Calmac Manufacturing Corp., Englewood, NJ

4. Evaluation of a Rule-Based, Ice Storage Controller Using Laboratory and Simulation Testing
James E. Braun, Ph.D., P.E., Member, Purdue University, West Lafayette, IN

Seminar 32

Effects of Design Build and Performance Contracts on Operations and Maintenance

Sponsor: TC 01.07 Operation and Maintenance Management
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Chair: James W. Gartner, Member, Roberts Gordon Inc., Cincinnati, OH

A growing number of facility new construction and rehab contracts are expected to be design build or performance contracts. The procedures and documentation are different from the more traditional plan and specification contracts awarded. There is continuing interest in optimizing facility performance with excellent operations and maintenance. This seminar explores the resulting short term and long-term effects on O&M from diverse viewpoints. Does O&M suffer or improve, and how?

1. The Design Build Business: Benefits, Challenges and Effects on the Life of the Facility
Brian T. King, Bovis Lend Lease Americas, Charlotte, NC

2. The O&M Benefits of a Long Term Guaranteed Energy Savings Partnership
James K. Willson, P.E., Member, C.E.M., Willson Performance Engineering, L.L.C., Carmel, IN

3. The Owners Engineering Viewpoint on Design Build vs. Plan and Specifications
Rex A. Watson, P.E., Ashley Capital, LLC, Chicago, IL

4. Commissioning Presence in Design Build and Performance Contracting on Operations and Maintenance from an Owner's Perspective
Carl Lawson, Member, PWI Consulting Engineers, Durham, NC

5. Is Certification the Next Step to TQM & ISO Assurance for Commissioning, O&M with Design Build and Performance Contracting?
Wayne A. Dunn, P.E., Member, Sunbelt Engineering, Inc., Jacksonville, FL

Seminar 33

Mold and Mildew in Commercial and Institutional Buildings

Sponsor: TC 09.08 Large Building Air-Conditioning Applications
APC Liaison: John Bisset, P.Eng., Chorley & Bisset, London, ON, Canada
Chair: Boggarm Setty, Member, Setty and Associates, Vienna, VA

Moisture generation in commercial and institutional buildings that is not controlled to the required dew point will promote mold and mildew and deterioration of the building. This seminar addresses the effect of mold and mildew on health care of patients and the facility itself. Speakers address ventilation, infiltration and other causes.

1. Dew-point Control in Commercial and Institutional Buildings
Bogarm Setty, P.E., Fellow, Setty and Associates, Vienna, VA

2. Controlling Mold and Mildew in Health Care Facilities
Ronald L. Westbrook, P.E., Member, State University of New York, Syracuse, NY

3. Effects of Mold and Mildew on Health Care Patient
Richard Hermans, Member, Center for Energy and Environment, Minneapolis, MN

4. HVAC Mold Control Source
Bob Baker, Member, RBJ Environmental, Tampa, FL

Forum 13 8 to 8:50 a.m

Engineers: How Well Does the ASHRAE Handbook Aid Your Room Air Distribution Needs?

Sponsor: TC 05.03 Room Air Distribution
APC Liaison: Wayne Frazell, Ft. Worth, TX
Moderator: Mo Hosni, Ph.D., Member, Kansas State University, Manhattan, KS

TC 5.3 is looking to enhance the information provided in Fundamentals Chapter 32 Space Air Diffusion and Systems, Chapter 17 Air Diffusing Equipment, as well as possibly creating a new chapter for Applications. The forum allows the membership, particularly engineers, to provide feedback and direction for chapter revisions. How can the chapters be more user friendly, what information is needed, how can actual design information be incorporated, how can interactive features of CD/DVD be included? No ideas are too far fetched with the changes taking place in the Handbook publications!

Forum 14 8 to 8:50 a.m.

How Secure Is Your Wireless Office Place?

Sponsor: TC 01.05 Computer Applications
APC Liaison: Arthur P. Garbarino, Air Service Inc., West Palm Beach, FL
Moderator: Charles H. Culp, Ph.D., P.E., Member, Texas A&M University, College Station, TX

Wireless technology is rapidly gaining wide usage and acceptance by A&E firms and their customers. Security of data is a major issue as hackers break into offices without ever entering. "Curb marking" and other methods are used. This forum focuses on the methods that A&E firms can use to protect their business and their data.

Forum 15 9 to 9:50 a.m.

Mechanical Dehumidification: What Information Does the Engineering Community Want to Know?

Sponsor: TC 07.05 Mechanical Dehumidification Equipment and Heat Pipes
APC Liaison: Arthur P. Garbarino, Air Service Inc., West Palm Beach, FL
Moderator: Harry M. Milliken, Member, Desert Aire Corporation, Lewiston, ME

TC 7.05 is concerned with mechanical dehumidification equipment and heat pipes and their design performance, applications and features. The TC seeks input from the engineering community regarding what information they would like to see in the new Handbook Chapter "Mechanical Dehumidifiers and Heat Pipes" for the 2004 Systems and Equipment Volume.

Forum 16 9 to 9:50 a.m.

Participation in Setting Long Term Goals for Handbook Chapter 18 - Fans

Sponsor: TC 05.01 Fans
APC Liaison: Wayne Frazell, Ft. Worth, TX
Moderator: John Cermak, Ph.D., Member, P. Eng, ACME Engineering and Manufacturing Corp., Muskogee, OK

TC 5.1 in Chicago decided to take a long term approach to all of its activities to support a completely new Chapter 18, Fans, in the 2012 ASHRAE Handbook. The TC seeks to use the newest available technologies to demonstrate sound, interactive technology, 3D modeling etc. The TC wants to use all its activities (research and program) to achieve this level of the chapter content to meet the needs and expectations in 2012. ASHRAE members' input is recognized as the major source in formulating the new chapter.

TUESDAY, 7/1 9 to 11 a.m.

Poster Session

APC Liaisons: Timothy J. McGinn, P.Eng. Keen Engineering Co., Ltd., Calgary, AB, Canada; Michael Brambley, Ph.D., Pacific Northwest National Laboratory, Richland, WA; and Jeff J. Traylor, PWI Consulting Engineers, Durham, NC

1. A Methodology for Analyzing the Association Between Student Performance and Indoor Air Quality (4635)

Chad Dorgan, Ph.D., P.E., Member, Farnsworth Group, Corona, CA

Past research that has evaluated the association between student performance and some change variable (building renovation, room temperature, curriculum, teacher involvement, etc.) has focused on student-level data and has not adequately accounted for regression artifacts (regression to the mean). The methodology presented in this paper provides guidance for the analysis of school-level student performance results through the use of the Smirnov Test (randomness), Lilleifors Test (normality), Daniel's Test (cohort trends), and Chi-squared Test (renovated to non-renovated differences). Recommendations are provided for setting up future research to avoid problems and obtain better results.

2. A Network Model to Simulate Performance of Variable Refrigerant Volume Refrigeration Systems (4636)

Shuangquan Shao, Tsinghua University, Bejing, P.R. China;Wenxing Shi, Xianting Li, Xiaofeng Peng, Xudong Yang

Variable refrigerant volume (VRV) refrigeration systems have been widely used in residential and light commercial buildings. Optimal design and control of VRV systems rely on experiments, for there are no effective tools to predict performance. A fluid network model has been developed to simulate the performance of variable refrigerant volume systems consisting of multiple indoor/outdoor units. This model is based on the analysis of system structure, refrigerant flow direction and refrigerant states in the pipes of a refrigeration system. The relationship matrix was built to describe the connection of the components and the refrigerant flow directions in the network.

3. A Parametric Analysis of a Grid-Independent BCHP System Focusing on Impact of Technological Advancements (4637)

Ali A. Jalalzadeh-Azar, Ph.D., P.E., Member, National Renewal Energy Laboratory, Golden, CO

Taking advantage of technological advancements for design and construction of building cooling, heating and power (BCHP) systems necessitates prioritization of the system components for optimum allocation of the available resources. Adopting this approach for a given application requires an assessment of the impact of improving the efficiencies of the constituent components on the overall BCHP performance.

4. A Tuning Method for PID Controller Using Optimization Subject to Constraints on Control Input (4638)

Keisuke Ozawa, Oyama National College of Technology, Oyama, Ibaraki, Japan; Yoshiyuki Noda, Toyohashi University of Technology, Toyahashi, Japan; Takanori Yamazaki, Ph.D., Tokyo Metropolitan College of Technology, Shinagawa-ku, Tokyo, JapanKazuyuki Kamimura, Member, Yamatake Building Systems Company, Ltd., Oota-ku, Tokyo, Japan; Shigeru Kurosu, Oyama National College of Technology, Oyama, Japan

This paper describes a tuning method for proportional-plus-integral-plus-derivative controller using optimization subject to constraints on control input. Its control performance for a first-order lag plus a dead time system is shown as an example of the commonly approximated controlled plants in the HVAC field. Attenuation of load disturbance is of primary concern for the HVAC control system. To avoid excessive overshoot in the response to reference input changes, the integral control with proportional-plus-derivative action in a secondary loop configuration can be chosen so that the responses to both reference input and load disturbance are slightly better damped.

5. An Overview of Particulate Matter in Indoor Environments: Part 1, Sources and Effects (4639)

Zhongchao Tan, Student Member, and Yuanhui Zhang, Ph.D., P.E., Member, University of Illinois - Urbana, Urbana, IL

This paper gives an overview of sources of indoor particulate matter (PM) and its effects on occupants. Studies indicate that outdoor PM contributes to indoor PM, yet a large fraction of indoor PM is generated indoors. The ratio of indoor to outdoor PM concentrations (I/O ratio) varies substantially due to different indoor conditions and PM spatial distributions. Real time investigation using multiple point sampling technique is needed for better understanding of PM spatial distribution.

6. Application of Particle Image Velocimetry for the Measurement of the Airflow Characteristics in an Aircraft Cabin (4640)

Sponsor: TC 09.03 Transportation Air Conditioning
Hailong (Robert) Mo, Ph.D., GENEXTECH, Germantown, MD; Mohammed H. Hosni, Ph.D., Member and Byron .W. Jones, Ph.D., P.E., Fellow, Kansas State University, Manhattan, KS

Velocity and turbulence intensity profiles of the airflow inside a section of a narrow-body (737) aircraft cabin were measured using the Particle Image Velocimetry (PIV) technique. The measurement technique is described and the results are presented and discussed. The purpose of this study was to provide accurate experimental data for validation of the Computational Fluid Dynamics (CFD) codes developed for this application. A thermal manikin was seated in one of the seats to simulate the physical and thermal presence of a human body. Each of the remaining 17 seats was equipped with a 100 W (341 Btu/h) heater to simulate the heat output of a person.

7. Building Energy Use and Control Problems: An Assessment of Case Studies (4641)

Morteza M. Ardehali, K.N. Toosi University of Technology, Tehran, Iran; Theodore F. Smith, Member, The University of Iowa, Iowa City, IA; John M. House, Member, Curtis J. Klaassen, Member, Iowa Energy Center, Ankeny, IA

Literature was reviewed of case studies that document the link between inefficient energy consumption of buildings and problems associated with controls and direct digital control systems. The problems were classified into four categories: hardware, software, human factor and unspecified. The findings of this review can help target research, development, testing and training activities to enhance direct digital control system performance, improving the energy efficiency of HVAC systems.

8. Building Mass in Dynamic Diurnal Cycles: An Experiment in Kenya (4642)

David M. Ogoli, Elgin, IL

The study examined whether a difference in mean radiant temperature (MRT) in test chambers was influenced by thermal mass, type of ceilings, exterior temperature or a combination of these factors when ventilation rates are kept constant. Four test chambers with variable overall thermal properties were parametrically monitored in Nairobi, Kenya. Data for dry-bulb temperature at four levels within the test chambers were gathered. The mean radiant temperature, floor surface temperature and wet bulb temperature were also observed and analyzed. The data show the effects of altitude, climate and thermal mass on annual energy-use and comfort in buildings at the equator.

9. Evaluation of an Infrared Two-Stage Heating System in a Commercial Application (4643)

Ronald MacDonald, P.E., Member, Mark Armstrong, Kenneth Boyd, Agviro, Inc., Guelph, ON, Canada

This paper provides the results of a three winter-season study to evaluate a two-stage infrared heating system in a commercial building with a frequently used, large overhead door. The results indicate that the infrared system provides a satisfactory alternative to the more conventional fan-forced space heater.

10. Experimental Validation of Design Cooling Load Procedures: The Radiant Time Series Method (4644)

Ipsent Iu, Student Member, Daniel E. Fisher, Ph.D., P.E., Member, and Chanvit Chantrasrisalai, Student Member, Oklahoma State University, Stillwater, OK; David S. Eldridge, Member, Grumman/Butkus Associates, Evanston, IL

The radiant time series method (RTSM) is a cooling load calculation procedure developed by ASHRAE as a simplified companion to the heat balance procedure. The RTSM was initially verified for a large parametric set of zone configurations by comparing cooling loads predicted by the RTSM with cooling loads predicted by the heat balance method. These experimental results demonstrate the validity of the previous parametric studies. The study demonstrates the validity of the RTSM for standard zone configurations and suggests that it can be used to obtain a first order estimate of cooling loads for solar heat gain dominated spaces.

11. Experimental Validation of Design Cooling Load Procedures: Facility Design (4645)

David S. Eldridge, Member, Grumman/Butkus Associates, Evanston, IL; Daniel E. Fisher, Ph.D., Member, Ipseng Iu, Student Member, and Chanvit Chantrasrisalai, Student Member, Oklahoma State University, Stillwater, OK

Two office-sized test cells were constructed to validate ASHRAE cooling load calculation procedures developed under RP-875 and codified in the ASHRAE Loads Toolkit (RP-987). The test cells were designed to test the cooling load procedures' ability to accurately predict cooling loads entirely dominated by solar and transient conductive heat gains. Laboratory and field testing validated the design and control of the facility prior to data collection. Preliminary tests showed that the facility was capable of validating the new ASHRAE cooling load procedures. The experimental uncertainty associated with the measured cooling load was less than 7.5 percent.

12. Experimental Validation of Design Cooling Load Procedures: The Heat Balance Method (4646) (RP-1117)

Sponsor: TC04.01, Load Calculation Data and Procedures

Chanvit Chantrasrisalai, Student Member, Daniel E. Fisher, Ph.D., P.E., Member, and Ipseng Iu, Student Member, Oklahoma State University, Stillwater, OK; David S. Eldridge, Member, Grumman/Butkus Associates, Evanston, IL

Under an ASHRAE research project (RP-1117), two office-sized test cells having identical geometry but different thermal mass were constructed to experimentally validate the performance of two new procedures for design cooling load calculations: the heat balance method (HBM) and radiant time series method (RTSM). In this paper, the HBM is compared with measured cooling loads. Results demonstrate that the HBM is fundamentally reliable, but that additional studies are required in order to determine the significance of input parameters for the carpeted zone and additional models are required in order to estimate the effect of blinds on the cooling load.

13. Large Eddy Simulation of Combustion in Compartment Fires (4647)

Wei Zhang, Ph.D., and Richard Roby, Ph.D., Combustion Science & Engineering, Inc., Columbia, MD

Compartment fires are common fire scenarios that exhibit most of the major physical phenomena of fires in enclosed spaces. Computational fluid dynamics has recently become a popular tool to model such fires. However, the physical and chemical processes of the compartment fire phenomena have prompted concern about the accuracy of detailed numerical simulations. This study is a benchmark test for the modeling of a compartment fire using the large eddy simulation (LES) approach with a simplified combustion model. While the LES approach can predict compartment fire phenomena reasonably well, the complexity of the combustion model is significant for accurate LES calculations.

14. Leakage of Ducted Air Terminal Connections: Part 1, Experimental Procedure and Data (4648) (RP-1132)

Sponsor: TC 05.02 Duct Design

Stephen A. Idem, Ph.D., Tennessee Technological University, Cookeville, TN; and Sunil Sahu, University of Tennessee, Knoxville, TN

Leakage data for ducted air terminal connections are reported. Leakage was found to increase with the increase in the static pressure adjacent to the terminal for the unsealed condition. With marginal sealing of rigid ducts leakage was found to be less than half that of the unsealed connection. The use of drawbands to mount air terminals to flexible ducts can reduce leakage. The application of a gasket to rectangular supply or return grilles is recommended.

15. Leakage of Ducted Air Terminal Connections: Part 2, Experimental Results (4649) (RP-1132)

Sponsor: TC 05.02 Duct Design

Sunil Sahu, University of Tennessee, Knoxville, TN; and Stephen A. Idem, Ph.D., Member, Tennessee Technological University, Cookeville, TN

Leakage data for ducted air terminal connections are reported. Leakage was found to increase with the increase in the static pressure adjacent to the terminal for the unsealed condition. With marginal sealing of rigid ducts leakage was found to be less than half that of the unsealed connection. The use of drawbands to mount air terminals to flexible ducts can reduce leakage. The application of a gasket to rectangular supply or return grilles is recommended.

16. Mechanism for Reaction Between Polyolester Lubricant and Ferrous Metals: Part 1, Literature Search (4650) (RP-1211)

Sponsor: TC 03.02 Refrigerant System Chemistry

Robert E. Kauffman, University of Dayton Research Institute, Dayton, OH

This paper summarizes results of a literature search performed to gain an understanding of the reaction mechanisms responsible for the catalytic effects of ferrous metals on the thermal degradation of polyolesters. The referenced papers indicate that the reaction is highly temperature dependent and may be initiated by the presence of dissolved iron species. Reaction mechanism candidates based on iron catalyzed thermal degradation and hydrolysis/dehydration of polyolesters are proposed to explain the reported experimental results of the cited researchers. The proposed reaction mechanisms will be tested and finalized in the second part of a planned research program.

17. Modeling and Development of Compression Heat Pumps in Integrated Ventilation and Heat Supply Units for Solar Passive Houses (4651)

Andreas Buhring, Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany; Gerhard Schmitz, Technical University Hamburg Harburg, Hamburg, Germany; and Karsten Voss, Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

Using a newly developed simulation model for electric-powered compression heat pumps, ventilation modules with an integrated exhaust air heat pump for supplying heat for solar passive houses are studied. Different designs can be compared before readings are taken from the first prototype. The capacity of the method is tested and the simulation model is validated on the example of a simulated integrated ventilation and heat supply unit for solar passive houses that is intensively measured. The power of the model is tested, and its advantages over the static designing of a heat pump are demonstrated by system simulation.

18. Performance Comparisons of a Unitary Split System Using Microchannel and Fin-Tube Outdoor Coils (4652) (RP-1195)

Sponsor: TC 08.04 Air-to-Refrigerant Heat Transfer Equipment

Jun-Hyeung Kim, Student Member, and Eckhard A. Groll, Ph.D., Member, Purdue University, Lafayette, IN

This paper investigates the performance of a unitary split system using microchannel heat exchangers instead of the conventional fin-tube designs as the outdoor coil for air conditioning and heat pumping applications. Microchannel heat exchangers are said to offer higher performance per unit weight and reduce refrigerant charge in vapor compression systems, but little is known about their performance characteristics in unitary equipment, especially with respect to the frosting and defrosting characteristics during heat pump mode. This paper describes the microchannel heat exchanger configurations and presents the results obtained during the cooling and heating/defrosting tests.

19. Pressure Loss Data for PVC Elbows, Reducers and Expansions (4653) (RP-1193)

Sponsor: TC 06.11 Pumps and Hydronic Piping

William J. Rahmeyer, Ph.D., Utah State University, Logan, UT

A total of 170 individual elbow, reducer, and expansion fittings from seven different vendors or manufacturers were tested in the ASHRAE project to determine pressure loss coefficients (K) of PVC fittings. The total number of individual test runs conducted for this study was 1,800 and were made in 13 different test setups. All of the tests were performed with Schedule 80 PVC pipe and PVC fittings.

20. Pressure Loss Data for PVC Tees (4654) (RP-1193)

Sponsor: TC 06.11 Pumps and Hydronic Piping

William J. Rahmeyer, Ph.D., Utah State University, Logan, UT

A total of 61 individual tee fittings from seven different vendors or manufacturers were tested in the ASHRAE project to determine pressure loss coefficients (K) of PVC fittings. The total number of individual test runs conducted for this study was 305 and were made in eight different test setups. All of the tests were performed with Schedule 80 PVC pipe and PVC fittings.

21. Reevaluation of the Gordon-Ng Performance Models for Water-Cooled Chillers (4655)

Wei Jiang, and Agami Reddy, Ph.D., P.E., Member, Drexel University, Philadelphia, PA

Selecting a performance model is an important and essential first step in improving the operation of existing chiller systems. Of the several chiller models proposed in the literature, one promising approach is the physical model formulation proposed by Gordon and Ng (GN). It has been evaluated by a couple of previous studies and found to be less accurate in predictive ability than black-box chiller models such as that used by DOE-2.

22. Secondary Properties of the Ammonia-Water Solution (4656)

Dawen Lu, LDS/Telesis PC, Richmond, VA; and Donald L. Fenton, Ph.D., P.E., Member, Kansas State University, Manhattan, KS

An accurate local measurement of ammonia concentration would assist the control and development of absorption refrigeration systems. In this project, the secondary property data available in the literature for the ammonia-water solution was reviewed along with an assessment of the currently available ammonia concentration detectors suitable for use with ammonia-water solutions. A calculation procedure for the speed of sound was developed over the entire concentration and temperature ranges. Surveying the current sensors for the detection of ammonia concentration yielded eight promising methods.

23. Smoke Extraction System Requirement for Basements and Performance-Based Fire Engineering Approach (4657)

W.K. Chow, The Hong Kong Polytechnic University, Hong Kong, Japan; and Longde Zhao, Ove Arup & Partners Hong Kong Limited, Kowloon Tong, Hong Kong, Japan

Performance-based fire safety codes would offer flexibility and cost effectiveness to many building developments, especially large ones. Traditional prescriptive fire safety codes, however, have the advantages of simplicity and ease of understanding. Many prescriptive codes already incorporate performance requirements so they also have the advantages of flexibility and cost effectiveness while maintaining simplicity and ease of understanding. This paper examines the Hong Kong fire service installation code requirement for smoke extraction systems on both smoke extraction rate and activation devices in basements.

24. Solid Sorption Gas-Fired Heat Pump (4658)

Sponsor: TC Amgad Elgowainy, Ph.D., P.E., Member, Purdue University Calumet, Highland, IN; Sam Shelton, Ph.D., Fellow, Georgia Institute of Technology, Atlanta, GA; and James Hogan, Dectron, Inc., Roswell, GA

A solid sorption gas-fired heat pump was designed and developed for residential space heating and cooling applications. The solid sorption technology uses natural gas as the energy source for compressing and circulating the refrigerant in the air-conditioning system. The system adopts a "thermal" compressor, composed of two cylinders (beds) filled with carbon particles, and employs ammonia as a refrigerant. The compressor operates based on a "thermal wave" concept for improved compression efficiency. A 2-ton (7 kW) solid sorption heat pump system prototype was built and tested. The system delivered 22,871 Btu/h (6.7 kW) of cooling at 95°F (35°C).

25. Test Method for Organic Acid Removal by Adsorbents Used in Liquid Line Filter Driers (4659) (RP-1028)

Sponsor: TC 03.03 Refrigerant Contaminant Control
Stephen L. Gunderson, University of Dayton Research Institute, Dayton, OH
Robert E. Kauffman, University of Dayton Research Institute, Dayton, OH

Research was conducted to develop and evaluate a test rig/test method designed to quantify the capabilities of adsorbents and commercial driers to extract short- and long-chain carboxylic acids from circulating refrigerant/oil/acid solutions under different temperatures and adsorbent water levels. Refrigerant/oil/acid solutions used in this study are refrigerants R-22, R-134a and R-410A; naphthenic pale oil and pentaerythritol ester oil based on pentanoic acid; and hexanoic and oleic organic acids. Adsorbents used are molecular sieves, silica gel, alumina, and a 50:50 mixture of molecular sieves and alumina. The optimized test rig and the acid capacities determined for the tested adsorbents are presented.

26. The Influence of the Operating Range of a Lorry's Refrigerating Equipment on the Quality of the Product (4660)

Pedro Juan Martinez and A. Velazquez, Universidad Politecnica de Cartagena, Cartagena, Espana, Spain; J.M. Pinazo, Universidad Politecnica de Valencia, Valencia, Espana, Spain

The temperature of frozen products while being transported should not exceed a legal limit. Stopping refrigerating equipment overnight is common practice to ensure drivers get a good night's sleep. Control parameters can be set on the thermostat of the refrigerating system to remove heat from the product during the day that neutralizes energy gain at night. A computer model was developed in the TRNSYS program environment to study the effect of this strategy on the transport conditions for the product. The discrepancies obtained revealed a poor air distribution, caused by uneven placement of cargo pallets.

27. Void Fraction Effects on Heat and Mass Transfer Coefficients in Aspend Pads of Various Thickness (4661)

Jose A. Perez-Galindo, Ph.D., Alfredo Payan-Rodriguez, and Ernesto Villalobos-Sanchez, Instituto Tecnologico de Durango, Durango, Durango, Mexico

Results of measurements of heat and mass transfer coefficients occurring during evaporative cooling in an experimental apparatus are presented. Void fraction changes were accomplished by placing controlled amounts of aspen pad material in the test section of the apparatus whose length was also varied. The resulting transfer coefficients were analyzed to correlate the data as a function of pertinent dimensionless variables. Several proposed characteristic lengths were evaluated on the basis of the quality of the statistical parameters for the correlations.

TUESDAY, 7/1 10:15 a.m. to 12:15 p.m.

Symposium KC-03-10

Coupling of Building Airflow and Energy Modeling Programs

Sponsor: TC 04.10 Indoor Environmental Modeling; TC 04.07 Energy Calculations
APC Liaison: Joy Altwies, Farnsworth Group Inc., Madison, WI
Chair: Jelena Srebric, Ph.D., Member, The Penn State University, University Park, PA

This field recently captured the attention of HVAC researchers and engineers due to its potential to tackle IAQ and thermal comfort problems, while using energy efficient HVAC systems. The symposium papers describe the following types of coupling: energy analysis and nodal or network airflow methods, inter-zone airflow, and pollutant dispersion; zonal or computational fluid dynamics methods for modeling air motion, indoor air quality and comfort conditions within rooms; and other advances related to the coupling of energy analysis and airflow programs.

1. An Adaptive Conflation Between Computational Fluid Dynamics and Thermal Simulation for Modeling Indoor Airflow and Convective Heat Transfer at Internal Building Surfaces

Ian Beausoleil-Morrison, Ph.D., Member, Natural Resources Canada, Ottawa, Canada; and Joe Clarke, Energy Systems Research Unit, Glasgow, Scotland, United Kingdom

2. Integration of Airflow and Energy Simulation using CONTAM and TRNSYS

Timothy P. McDowell, Member, Thermal Energy System Specialists, Madison, WI; Steven Emmerich, Member, National Institute of Standards and Technology, Gaithersburg, MD; Jeff Thornton, Member, Thermal Energy System Specialists, Madison, WI; George Walton, Member, National Institute of Standards and Technology, Gaithersburg, MD

3. Towards External Coupling of Building Energy and Airflow Modeling Programs

Ery Djunaedy and Jan Hensen, Ph.D., Member, Technische Universiteit Eindhoven, Eindhoven, Netherlands; M.G.L.C. Loomans, Ph.D., The Netherlands Organisation for Applied Scientific Research (TNO), Delft, The Netherlands

4. On the Effects of Decoupling Airflow and Heat Balance in Building Simulation Models

Per Sahlin, Ph.D., Member, EQUA Simulation AB, Sundbyberg, Sweden

Seminar 34

Basic Refrigerated Warehouse Design

Sponsor: TC 10.05 Refrigerated Distribution and Storage Facilities
APC Liaison: Arthur P. Garbarino, Air Service, Inc., West Palm Beach, FL
Chair: Garry A. Peakman, Associate, Zeroloc Enterprises Ltd., Richmond, BC, Canada

Speakers enlisted from TC 10.5 present basic design concepts necessary to build a refrigerated warehouse. Topics addressed include evaporative condensers, management of infiltration and refrigeration system design. This seminar is geared toward new engineers but all are welcome to attend.

1. Use of Liquid Desiccant Evaporators in Dock and Freezer Applications

Ajay R. Chatlani, Member, ME Chemical Engineer, Niagara Blower Co., Buffalo, NY

2. Operation of Evaporative Condensers

Glenn Comisac, Associate, Baltimore Aircoil, Baltimore, MD

3. Single- vs. Two-stage Refrigeration Systems

Todd B. Jekel, Ph.D., Associate, IRC-U.W. Madison, Madison, WI

4. Infiltration Protection for Conveyor Belt Openings into Freezers

George R. Smith, P.E., Member, HCR Inc., Lewistown, MT

Seminar 35

Clearing the Air on Kitchen Ventilation

Sponsor: TC 05.10 Kitchen Ventilation
APC Liaison: Frederick W. Betz, P.E., A.M. Kinney, Cincinnati, OH
Chair: Derek W. Schrock, Member, Halton Co., Scottsville, KY

This session presents a series of articles related to current issues in kitchen ventilation published in the June 2003 ASHRAE Journal. A broad range of topics are presented including the kitchen HVAC and makeup units, field testing and commissioning, myths and realities of mechanical filters, estimating energy use of commercial kitchen ventilation, and the effects of makeup air on hood performance.

1. Total Kitchen HVAC and Today's Replacement Air Units and Options

Stephen L Brown, Associate, LC Systems, Columbus, OH

2. Field Testing and Commissioning of Restaurant HVAC Systems

Stephen K Melink, Member, P. Eng, Melink Corporation, Cincinnati, OH

3. Mechanical Filters In Kitchen Ventilation: Myths and Reality

Andrey V. Livchak, Ph.D., Member, Halton Co., Scottsville, KY

4. Estimating Energy Use of Commercial Kitchen Ventilation

Donald R Fisher, P.E., Associate, Fisher Nickel Inc., San Ramon, CA

5. The Effects of MUA on Hood Performance

Richard T Swierczyna, Associate, Architectural Energy Corp., Wood Dale, IL

Seminar 36

Everything You Ever Wanted to Know About Fees (But Were Afraid to Ask)

Sponsor: TG1 General Legal Education
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Chair: Maralynne Flehner, Member, Esq., King of Prussia, PA

The first of TG1-GLE's business and management programs, this seminar discusses the risks and benefits of fee arrangements; the relationship between fee structures and financial success; how to negotiate fees to avoid future disagreements; important fee related contract provisions; documentation for substantiating fee claims; fee management,

including progress payments, control over expenditures, managing margins and overhead; what to do if the client isn't paying, or demands a fee reduction or free extras; evaluating legal options for collecting fees; and how to decide whether to pursue legal remedies or write off receivables. This program is a must for HVAC&R business owners!

1. Setting Your Fees
William J. Coad, Fellow, Presidential Member, Coad Engineering Enterprises, St. Louis, MO

2. Protecting Yourself Through Contracts and Proper Documentation
Margaret D. Lineberry, Esq., Shook, Hardy & Bacon, LLP, Kansas City, MO

3. How to Manage Fees and What to Do if Your Client Isn't Paying or Demands Free Extras
Richard H. Rooley, Fellow, FREng., Rooley Consultants, Stoke Poges, Bucks, England

4. Should You Write It Off or Try to Collect? Evaluating Your Legal Options When Business Options Fail
Maralynne Flehner, Member, Esq., King of Prussia, PA

Seminar 37

Mold and Mildew Control and Observations on Residential Construction

Sponsor: TG9 Moisture Management in Buildings
APC Liaison: Kirk T. Mescher, P.E., CM Engineering, Columbia, MO
Chair: Ronald Bailey, P.E., Member, Bailey Engineering Corp., Jupiter, FL

With the concern of mold and mildew in residential construction becoming more of a viable concern among homeowners, insurance companies and realtors, we feel it is at a point where possibilities of cures and mitigation should be identified. This seminar looks at some of the observations and ways to contain and mitigate mold and mildew in residential construction.

1. Reasons for Room Humidity Control in Residential Construction
Rodney Lewis, P.E., Fellow, Rodney Lewis Associates, Houston, TX

2. Mold Formation in Cathedral Ceilings: Hygrothermal Analysis and Solutions
Hartwig M. Kunzel, Member, Dr.-Ing., Fraun Hofen Institute Bauphysik, Valley, Germany

3. Moisture Performance of Crawl Spaces in Mixed Climate: Is Ventilation Needed?
Achilles Karagiozis, Ph.D., P.E., Member, Oak Ridge National Laboratory, Oak Ridge, TN

4. Observations on the Dynamics of Humidity and CO_2 Levels on Mold Growth in a Residential Application
Mark Lentz, Member, Lentz Engineering, Sheboygan Falls, WI

Seminar 38

RES Integrated Sustainable Buildings

Sponsor: TC 06.07 Solar Energy Utilization; TC2.8 Building Environmental Impacts and Sustainability
APC Liaison: Carl N. Lawson, PWI Consulting Engineers, Durham, NC
Chair: Svein O. Morner, Ph.D., P.E., Member, Farnsworth Group, Madison, WI

The objective is to cover the inextricable linkage of three topics: renewable energy sources (RES) and renewable materials sources (or together resources) crucial role for approaching sustainable buildings; elucidation of buildings sustainability criteria/indicators and dependence on RES; and importance of building performance simulation and reliable RES effectiveness and load coverings predictions for successful RES implementation and sustainable buildings construction, operation and related technologies dissemination.

1. Solar Assisted Seasonal Heat Storage in Greece: Simulations and Case Studies
Constantinos A. Balaras, Ph.D., Member, National Observatory of Athens, P.Penteli, Greece

2. Renewable Energy for Sustainable Buildings in New Jersey: Actual Case Studies of PV, Wind Power and Biogas
Nick Stecky, Johnson Controls, Inc., Union, NJ

3. Buildings Polivalent Facades Performance Simulation and Optimization: Solar, Thermal, PV, Daylighting and Thermal Load Control
Branislav Todorovic, Ph.D., Member, University of Belgrade, Belgrade, Yugoslavia

4. Low Energy Heating and Air Conditioning: An Efficient Solution for Solar Energy Applications in Buildings
Peter Novak, Ph.D., Member, Energotech d.o.o, Ljubljana, Slovenija

5. RES Integrated Building's Performance Simulation and Energy Efficiency Optimization for Sustainable Local and Regional Development
Marija S. Todorovic, Ph.D., Member, University of Belgrade, Belgrade, Yugoslavia

Seminar 39

Uses of Weather Data in Building Design and Operation

Sponsor: TC 04.02 Weather Information
APC Liaison: John B. Bisset, P.Eng., Chorley & Bisset, Ltd., London, ON, Canada
Chair: Ronald Petersen, Ph.D., Member, Cermak Peterka Petersen, Inc., Fort Collins, CO

This seminar discusses the use of weather data for such applications as 1) assessing expected air quality levels due to exhaust stacks; 2) assessing the impact of climate change on buildings energy use, peak demand, costs, equipment life, and comfort/discomfort; and 3) characterizing the potential impact of climate change on a prototype small office building. Engineering weather data compiled and distributed by DOD is discussed. This data is used for sizing heating and cooling equipment and estimating energy consumption for those systems.

1. Engineering Weather Data
Jeffrey H. Zautner, AFCC/DOPT, Asheville, NC

2. Impact of Climate Change on a Small Office Building
Drury B. Crawley, Member, US Department of Energy, Washington, D.C.

3. Uses of Weather Data for Building Exhaust and Intake Design
John J. Carter, Member, Cermak Peterka Petersen, Inc., Fort Collins, CO

4. Weather Data for Building and Plant Design; Coincident and Near-Extreme Values
Andrew Wright, Ph.D., UMIST, Manchester, United Kingdom

Forum 17 10:15 to 11:05 a.m.

What Do ASHRAE Members Need from an Advanced Building Energy Performance Guideline?

Sponsor: TC 09.06 Systems Energy Utilization
APC Liaison: Donald C. Hardin, Enviromatic Systems, Ft. Worth, TX
Moderator: Harry P. Misuriello, Member, Alliance to Save Energy, Washington, DC

This forum addresses the needs for design guidelines for highly energy efficient new buildings. There has been considerable debate within the Society as to ASHRAE's role in producing such guidelines. This forum facilitates understanding issues surrounding this debate as well as helping set future direction within ASHRAE.

Forum 18 11:15 a.m. to 12:05 p.m.

What Are the Time and Cost Barriers to Good O&M Practices?

Sponsor: TC 01.07 Operation and Maintenance Management
APC Liaison: Donald C. Hardin, Enviromatic Systems, Ft. Worth, TX
Moderator: Adolph John Rydzewski, Member, E. I. DuPont de Nemours & Co, Inc., Wilmington, DE

Facility managers are squeezed from all directions: budget (energy, capital, labor, earnings), fear of litigation (IAQ, mold, mildew) and reliability (productivity, uptime). I'm sure you can add many more!! Successfully managing these diverse and often opposed issues is a real balancing act. This forum provides an opportunity to discuss typical barriers and more importantly, ways to provide adequate O&M within the confines of these barriers (and maybe even an opportunity to vent some).

WEDNESDAY, 7/2 8 to 10 a.m.

Symposium KC-03-11

Advances in Indoor Air Quality Control

Sponsor: TC 02.02 Plant and Animal Environment
APC Liaison: Timothy J. McGinn, P.Eng., Keen Engineering Co., Ltd., Calgary, AB, Canada
Chair: Zhongchao Tan, Student, University of Illinois at Urbana, Urbana, IL

The past 20 years have seen an increasing concern of air quality in indoor environments, including agricultural, residential and commercial buildings. This symposium provides a platform for ASHRAE members to meet and discuss the latest developments in indoor air quality study and related areas.

1. Analysis and Validation of Particle Separation Efficiency in a Centrifugal Field Under Laminar and Perfect Mixing Conditions
Yuanhui Zhang, Ph.D., P.E., Member, University of Illinois at Urbana, Urbana, IL

2. Effectiveness of Local Supply Ventilation in Improving Worker Zone Air Quality in Swine Confinement Buildings: A Pilot Study
Sheryll B. Jerez, Student Member, University of Illinois at Urbana-Champaign, Urbana, IL; Ronaldo G. Maghirang, Ph.D., Member, Kansas State University, Manhattan, KS

3. Total Air Age in the Room Ventilated by Multiple Air-Handling Units: Part 1, An Algorithm
Dongning Li and Xianting Li, Ph.D., Member, Tsinghua University, Beijing, China; Xudong Yang, Ph.D., Member, University of Miami, Coral Gables, FL; Chunpeng Dou, Tsinghua University, Beijing, China

4. A New Mass Transfer Based Model of VOC Emissions from Building Materials
Ying Xu, Yinping Zhang, Ph.D., Member, and Tongbao Cheng, Tsinghua University, Beijing, China

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Symposium KC-03-12

Improving the Energy Performance of Windows

Sponsor: TC 04.05 Fenestration
APC Liaison: Wayne Frazell, P.E., Ft. Worth, TX
Chair: Michael R. Collins, Ph.D., Associate, Dr., University of Waterloo, Waterloo, ON, Canada

A number of topics that affect the energy performance of fenestration are examined: the affect that storm windows have on the winter performance of fenestration; a comparison between calculated and measured heat transfer coefficients; and a discussion of how future products will need to perform in order to meet the demands of sustainable housing.

1. Measured Winter Performance of Storm Windows
Joseph H. Klems, Member, Sci. Dr., Lawrence Berkeley National Laboratory, Berkeley, CA

2. Comparison of Calculated and Measured Indoor Side Temperature Profiles
John L. Wright, Ph.D., Member, P. Eng, University of Waterloo, Waterloo, ON, Canada
Alexander G. McGowan, Member, Levelton Engineering Ltd., Victoria, BC, Canada

3. Future Advanced Windows for Zero Energy Homes
Josh Apte, Dariush Arasteh, P.E., Member, and Joe Huang, Member, Lawrence Berkeley National Laboratory, Berkeley, CA

Seminar 40

Effects of Cycling on Unitary System Performance

Sponsor: TC 07.06 Unitary Air Conditioners and Heat Pumps
APC Liaison: Joy Altwies, Farnsworth Group, Inc., Madison, WI
Chair: Gregory J. Rosenquist, Member, Lawrence Berkeley National Laboratory, Berkeley, CA

The performance of unitary air-conditioning equipment is generally well understood at steady-state conditions. But the performance during part-load conditions when cycling is required to meet building load is less well known. The presentations address the impact that cycling has on equipment performance. Three of the four presentations address the impact that cycling has on capability of equipment to dehumidify during part-load conditions while the remaining presentation provides recent information on the cycling performance of residential equipment and its relation to the degradation coefficient.

1. Understanding the Dehumidification Performance of Air-Conditioning Equipment at Part-Load Conditions: Background and Theory
Hugh I. Henderson, Member, CDH Energy Corp., Cazenovia, NY

2. Understanding the Dehumidification Performance of Air-Conditioning Equipment at Part-Load Conditions: Test Results
Don B. Shirey, III, Member, Florida Solar Energy Center, Cocoa, FL

3. Rapid-Cycling for Control of Capacity and Humidity
Clark Bullard, Ph.D., Fellow, University of Illinois at Urbana-Champaign, Urbana, IL

4. New Defaults for the Cyclic Degradation Coefficient Used in Rating Central Air Conditioners and Heat Pumps
Brian P. Dougherty, Associate, National Institute of Standards and Technology, Gaithersburg, MD

Seminar 41

Hazard Classifications of Laboratories

Sponsor: TC 09.10 Laboratory Systems
APC Liaison: John B. Bisset, P.Eng., Chorley & Bisset, Ltd., London, ON, Canada
Chair: Andrew A. Dymek, P.E., Member, Newcomb & Boyd, Atlanta, GA

There are numerous different types of laboratory functions based on specific needs and risks. There is however, no industry means of classifying these different risks and needs into respectively different physical and operational environments. Instead, the industry has historically tended to treat all laboratories with a one size fits all approach, in terms of required air change rates, 100 percent outside air and the like. This seminar explores the need for a hazard classification of laboratories that the industry could use for design parameters and operational protocols.

1. How to Classify Laboratories
Andrew A. Dymek, P.E., Member, Newcomb & Boyd, Atlanta, GA

2. Assessing the Conservatism in Laboratory HVAC Design Opportunities for "Right-Sizing" HVAC Systems According to Risks
Patrick J. Carpenter, P.E., Member, Kling Lindquist, Philadelphia, PA

3. Design Approach Distinctions Between Various Lab Types
Janet S. Baum, AIA, Health Education, St. Louis, MO

4. Laboratory Hazard Classifications: The Research University Perspective
Terrance G. Alexander, P.E., CIH, The University of Michigan, Ann Arbor, MI

Seminar 42

Microturbines in CHP Applications

Sponsor: TC 09.05 Cogeneration Systems
APC Liaison: Kenneth M. Clark, P.E., Burns & McDonnell, Kansas City, KS
Chair: James A. Parsons, Ph.D., Member, Mississippi State University, Mississippi State, MS

This session offers four presentations on microturbines and integrated cooling, heating, and power (CHP) systems. The first three cover CHP systems at various stages: one in the design stage, one in the beginning operation stage and one in the retrofit stage with a new, downsized microturbine coupled to existing thermally activated devices. Thorny

engineering challenges, construction costs, operating economics, component matching, controls, and fuel flexibility issues are discussed. The fourth presentation shows models for predicting microturbine performance.

1. Design of a Combined Heat and Power System for U.S. Air Force Dormitories
Michael K. West, Ph.D., P.E., Member, Advantek Consulting, Inc., Melbourne, FL

2. A Microturbine Demonstration Project at Floyd Bennett Field
Dennis R. Landsberg, Ph.D., P.E., Member, CEM, Landsberg Engineering, P.C., Clifton Park, NY

3. Evolution of the Microturbine Based CHP System at the University of Maryland
Reinhard Radermacher, Ph.D., Member, University of Maryland, College Park, MD

4. Modeling Microturbines
James A. Parsons, Ph.D., Member, Mississippi State University, Mississippi State, MS

Seminar 43

Wireless Sensors for Building Applications

Sponsor: TC 04.11 Smart Building Systems; TC 1.4 Control Theory and Application
APC Liaison: Michael R. Brambley, Ph.D., Pacific Northwest National Laboratory, Richland, WA
Chair: William M. Healy, Ph.D., Member, National Institute of Standards and Technology, Gaithersburg, MD

With significant technological advances in wireless communication technology, engineers and scientists have begun to explore the use of wireless sensors for building applications. This seminar discusses the utilization of wireless sensors in buildings, including their advantages and disadvantages over conventional wired networks and the obstacles that are faced in deploying wireless sensor technology in homes, offices, and factories. Applications where HVAC systems and the building environment are monitored and controlled through wireless sensor networks are described along with efforts to standardize wireless sensing platforms.

1. Wireless Data Acquisition for Monitoring, Fault Detection, and Diagnostics for Package Rooftop HVAC Units
Michael R. Brambley, Ph.D., Member, Pacific Northwest National Laboratory, Richland, WA

2. Wireless Technology for In-Building HVAC Sensing and Control Applications
Michael Kintner-Meyer, Ph.D., Member, Pacific Northwest National Laboratory, Richland, WA

3. Wireless Measurement and Control of the Indoor Environment in Buildings
Clifford C. Federspiel, Ph.D., Associate, University of California at Berkeley, Berkeley, CA

4. The Use of a Wireless Sensor Network for Mapping Environmental Conditions of Buildings
William M. Healy, Ph.D., Member, National Institute of Standards and Technology, Gaithersburg, MD

Forum 19 8 to 8:50 a.m.

Integrated Building Design: What Is ASHRAE Overlooking?

Sponsor: TC 04.12 Integrated Building Design
APC Liaison: Kirk T. Mesher, P.E., CM Engineering, Columbia, MO
Moderator: Charles E. Gulledge, III, P.E., Member, Moser Mayer Phoenix & Associates, PA, Greensboro, NC

TC 4.12 seeks input on what ASHRAE may be overlooking, or not addressing properly, in the integrated building design (IBD) process. Feedback will be used to develop future programs and to recommend, if applicable, future Society research or publications relating to the IBD process.

Forum 20 8 to 8:50 a.m.

Passenger Rail Vehicle HVAC Design and Application: What are the Most Important Issues that New Guideline Project Committee GPC 23 Should Address?

Sponsor: TC 09.03 Transportation Air Conditioning
APC Liaison: Carl N. Lawson, PWI Consulting Engineers, Durham, NC
Moderator: Kenneth Hesser, Member, LTK Engineering Svcs., Ambler, PA

Project committee GPC 23 has been formed to establish guidelines for the design and application of HVAC equipment for use on passenger rail vehicles and seeks opinions. Topics under consideration for this guideline include environmental design conditions, ventilation rates, air filtration, temperature and humidity controls, passenger comfort criteria, materials, equipment design for vibration and shock, refrigerant selection, energy efficiency, corrosion protection and electrical requirements.

Forum 21 9 to 9:50 a.m.

ASHRAE Research 2004 and Beyond

Sponsor: Research Advisory Panel
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Moderator: John Mitchell, Ph.D., Fellow, University of Wisconsin-Madison, Madison, WI

As the needs of ASHRAE members change, the research sponsored by ASHRAE must keep up or hopefully precede these changes. ASHRAE is developing a Master Research Plan, which if it is to have widespread acceptance, it must have widespread input from the ASHRAE membership. At the Kansas City ASHRAE meeting, the Research Advisory Panel (RAP) will report on the initial input and ask for additional input from the ASHRAE membership. Since time at the

forum is limited, written comments before and after the forum are welcome. Comments should be sent to John Mitchell, Chair of RAP, email Mitchell@engr.wisc.edu

Forum 22 9 to 9:50 a.m.

What Information Should ASHRAE Handbooks Include About In-Space Convection Heating Systems?

Sponsor: TC 06.04 In Space Convection Heating
APC Liaison: Kirk T. Mescher, P.E., CM Engineering, Columbia, MO
Moderator: Birol I. Kilkis, Ph.D., Member, Watts Radiant, Springfield, MO

In-space convection heating systems can now be used not only as a stand-alone system but can also be designed and sized to meet peak loads, while central systems are kept at a base load. At a time when indoor air quality is becoming a more important parameter, in-space convection heaters are now on a unique balance between scrutiny and preference. This forum addresses how rating, comparing and evaluation parameters may be included in ASHRAE Handbook chapter(s) from technical, economical and air quality perspectives with technical reference to new types and applications.

WEDNESDAY, 7/2 10:15 a.m. to 12:15 p.m.

Symposium KC-03-13

HVAC Is for People

Sponsor: TC 02.01 Physiology and Human Environment
APC Liaison: James K. Willson, P.E., Willson Performance Engineering LLC, Carmel, IN
Chair: James J. Bushnell, Member, HVAC Consulting Services, Solana Beach, CA

This symposium is a continuing series presenting research results related to human thermal comfort and associated interactive subjects. The papers report on thermal comfort studies using actual human subjects under highly transient and non-uniform conditions. The data collected is further related to new comfort models developed to assist in future research in this area.

1. Investigation of Human Thermal Comfort Under Highly Transient Conditions for Automobile Applications, Part 1 Experimental Design and Human Subject Testing Implementation
Yanzheng (Don) Guan, Student Member, Mo Hosni, Ph.D., Member, Kansas State University, Manhattan, KS. Byron W. Jones, Ph.D., P.E., Fellow, Kansas State University, Manhattan, KS; Thomas P. Gielda, Ph.D., Member, Visteon Automotive Systems, Plymouth, MI

2. Investigation of Human Thermal Comfort Under Highly Transient Conditions for the Automobile Applications, Part 2: Thermal Sensation Modeling
YanZheng (Don) Guan, Ph.D., Student, Mohammad H. Hosni, Ph.D., Member, and Byron W. Jones, Ph.D., P.E., Fellow, Kansas State University, Manhattan, KS; Thomas P. Gielda, Ph.D., Member, Visteon Automotive Systems, Plymouth, MI

3. Literature Review of the Advances on Thermal Comfort Modeling
Yanzheng (Don) Guan, Member, Mohammad H. Hosni, Ph.D., Member, and Byron W. Jones, Ph.D., P.E., Fellow, Kansas State University, Manhattan, Kansas; Thomas P. Gielda, Ph.D., Member, Visteon, Inc., Plymouth, MI

4. A Field Study of Thermal Environment in Residence Buildings in Harbin (4664)
Zhao-jun Wang, Ph.D., Gang Wang, and Leming Lian, Harbin Institute of Technology, Heilongjiang, China

5. The Uncertainty Associated with Thermal Comfort (4665)
Louay M. Chamra, Ph.D., Member, W. Glenn Steele, Ph.D., Member, and Kien Huynh, Student Member, Mississippi State University, Mississippi State, MS

Seminar 44

Current Testing and Balancing Topics

Sponsor: TC 09.07 Testing and Balancing
APC Liaison: Michael Brambley, Ph.D., Pacific Northwest National Laboratory, Richland, WA
Chair: Rodney H Lewis, P.E., Fellow, Rodney H. Lewis Associates, Inc., Houston, TX

There are many issues of interest that need to be discussed: TAB training and certification, balancing underfloor air distribution systems, balancing variable flow hydronic systems, TAB interface with TCC.

1. TAB Technician Training and Certification
Eli Howard, Member, SMACNA, Chantilly, VA

2. Balancing Underfloor Air Distribution Systems
Gaylon Richardson, Fellow, Engineered Air Balance Co., Inc., Houston, TX

3. Balancing Variable Flow Hydronic Systems
Mark Hegberg, Member, ITT Bell & Gossett, Morton Grove, IL

4. Issues Associated with Balancing Fan Powered Terminal Units
Jason P. Bobruk, Member, Nailor Industries, Inc., Houston, TX

5. TAB Interface With TCC: What Is Expected?
Larry J. Fisher, Member, ECT Building Automation, Louisville, KY

Seminar 45

Filtration for Chemical and Biological Agents

Sponsor: TC 02.04 Particulate Air Contaminants and Particulate Contaminant Removal Equipment; TC 2.03 Gaseous Air Contaminants and Gas Contaminant Removal Equipment
APC Liaison: Arthur P. Garbarino, Air Service, Inc., West Palm Beach, FL
Chair: Brian Krafthefer, P.E., Member, DEE, Honeywell, Int., Minneapolis, MN

This seminar looks at building and occupant protection from a chemical or biological event. The information attempts to cover what should be, is, and might not be considered in buildings to provide building protection and a safer environment for the occupants in the event of a terrorist attack using chemical or biological agents. The presentations provide an indication of current considerations in this area to address this issue and how, when, or if filtration should be used, and how/or if filtration could be used for dilution of indoor air for venting and reducing agent levels.

1. Filtration and Air Cleaning: Is It the Siler Bullet?
H. E. (Barney) Burroughs, P.E., Presidential Member, Fellow, Life, Building Wellness Consultancy, Inc, Atlanta, GA

2. Protecting Against Chemical Agents of War: Applying Internal Filtration
Christopher O. Muller, Member, Purafil, Inc., Doraville, GA

3. Use of Surrogate BWA to Test Particulate Air Filters
Karin Foarde, Ph.D., Member, RTI Int., Research Triangle Park, NC

4. New Technologies for Chem/Bio Agent Removal
Dean T. Tompkins, Ph.D., Member, University of Wisconsin-Madison, Madison, WI

Seminar 46

Future Developments in Absorption

Sponsor: TC 08.03 Absorption and Heat Operated Machines
APC Liaison: Frederick W. Betz, P.E., A.M. Kinney, Cincinnati, OH
Chair: Laura A. Schaefer, Ph.D., Associate, University of Pittsburgh, Pittsburgh, PA

Do absorption technologies have a role to play in future building systems? When energy efficiency, smaller environmental impact and improved economics are important, the answer is "Yes." The presenters discuss cutting-edge absorption applications, the potential future directions for absorption and the relevance of absorption technology.

1. Prototype Results of a Small-Scale Ammonia-Water Absorption Unit for Cogeneration Applications
G Anand, Ph.D., Member, Energy Concepts Co., Annapolis, MD

2. Sustainable Absorption Systems
Vikas Patnaik, Ph.D., Member, Trane, La Crosse, WI

3. Advances and Directions in Absorption Chillers
Jay Kohler, Associate, York International, York, PA

4. The Behavior of Droplets in Horizontal Tube Banks with Falling Films of Aqueous Lithium Bromide
Srinivas Garimella, Ph.D., Member, Iowa State University, Ames, IA

Seminar 47

Geothermal Heat Pump Projects: Energy and Maintenance Savings from Real World Projects

Sponsor: TC 06.08 Geothermal Energy Utilization
APC Liaison: Jeff J. Traylor, P.E., PWI Consulting Engineers, Durham, NC
Chair: John A. Shonder, Member, Oak Ridge National Laboratory, Oak Ridge, TN

Compared with conventional equipment, GHPs can provide significant reductions in energy use and demand, and substantial savings in energy and maintenance costs. But how do these systems perform in the field? The speakers present hard numbers on the energy and maintenance savings achieved in GHP projects installed in a variety of applications across North America. Key lessons learned for those who wish to use GHP technology in their own buildings are presented.

1. Operating Savings with Ground Source Heat Pumps in Commercial Buildings in Northern Applications
Doug Cane, Caneta Research, Inc., Mississauga, ON, Canada

2. Pleasant Surprises for GHP System Owners in the Western U.S.
Cary Smith, Member, Sound Geothermal Corporation, Roosevelt, UT

3. Performance of a Standing Column Well GHP System in a New England Elementary School
Carl Orio, Member, Water Energy Distributors, Inc., Atkinson, NH

4. Geothermal Heat Pumps in Southwestern U.S. Applications
Greg Tinkler, Member, Enlink Geoenergy, Inc., Houston, TX

Seminar 48

Successful Applications of Energy Simulation in Building Design

Sponsor: TC 04.07 Energy Calculations
APC Liaison: Don C. Hardin, Enviromatic Systems, Ft. Worth, TX

Chair: Vernon A. Smith, P.E., Associate, Architectural Energy Corp., Boulder, CO

Using simulations is becoming more common in new construction during the preliminary and detailed design phases to improve energy efficiency and to reduce capital and operating costs. Simulations have typically been used to predict performance of innovative designs for ultra high performing green buildings. This seminar covers application of simulations to more conventional construction projects. Experiences in using simulation for qualifying for utility or government incentive programs are also highlighted.

1. Some European Experiences with Applying Simulation in Consultancy
Jan L. M. Hensen, Ph.D., Member, Technische Universiteit Eindhoven, Eindhoven, Netherlands

2. Using Energy Models to Influence Design and Construction
Jim Douglas, P.E., Member, The Weidt Group, Minnetonka, MN

3. Real-World Integrated Design Practice and Tools: Effective Energy Performance Analysis Approaches
Curt Hepting, P.E., P. Eng, EnerSys Analytics Inc., Coquitlam, BC., Canada

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Forum 23 10:15 to 11:05 a.m.

Building Environmental Impacts and Sustainability: ASHRAE's Newest Technical Committee

Sponsor: TC 02.08 Building Environmental Impacts and Sustainability
APC Liaison: Kirk T. Mescher, P.E., CM Engineering, Columbia, MO
Moderator: Mark E. Case, P.E., Member, etc Group, Inc., Salt Lake City, UT

In response to the increased awareness and concern about buildings impact on the environment and the numerous issues surrounding sustainability, a new Technical Committee 2.8, Buildings Impact on the Environment, was created and first met in January 2003. This forum introduces the committee and provides a brief background on its formation and intent. Ideas are sought for programs, research and other activities for the committee to pursue and to stimulate interest from those in attendance.

Forum 24 10:15 to 11:05 a.m.

Function or Design: What Defines a Laboratory?

Sponsor: TC 09.10 Laboratory Systems
APC Liaison: Kelley P. Cramm, P.E., IDEA, Kansas City, MO
Moderator: James L. Coggins, Ph.D., P.E., Fellow, Select Energy Services, Inc., Columbia, MD

The question of what defines a laboratory has risen in discussions of whether laboratories should be covered by ASHRAE Standard 62.1, "Ventilation for Acceptable Indoor Air Quality." Some members of TC 9.10 believe that labs are adequately covered by other safety-oriented standards and should be exempt from Standard 62.1. Others believe that 62.1 has sound requirements in equipment design, operations and maintenance that are not covered by other standards. A necessary step in this coverage discussion is to agree on what constitutes a lab.

Forum 25 11:15 a.m. to 12:05 p.m.

Design Considerations to Limit Dispersion of Immediately Harmful Contaminants in Large Buildings and Enclosed Vehicular Facilities

Sponsor: TC 05.09 Enclosed Vehicular Facilities; TC4.10 Indoor Environmental Modeling
APC Liaison: Kirk T. Mescher, P.E., CM Engineering, Columbia, MO
Moderator: Paul C. Miclea, P.E., Member, PMP, Earth Tech, Inc., Oakland, CA

Ventilation systems in such facilities have not been designed to address these cases and therefore there are no criteria for what should be done in such circumstances to prevent the dispersion of harmful contaminants and minimize the risk to occupants. This forum is recommended to generate ideas to be considered in the future for the design of new facilities and the best approach to managing risks in existing facilities. Discussions may expand on the "Report of Presidential Ad Hoc Committee for Building Health and Safety under Extraordinary Incidents (January 26, 2003)."

Forum 26 11:15 a.m. to 12:05 p.m.

Why Can't I Find or Hire Entry-Level Engineers?

Sponsor: Membership Promotion Committee
APC Liaison: Kelley P. Cramm, P.E., IDEA, Kansas City, MO
Moderator: Micheal D Byars, Member, WisTexan Consulting LLC, La Crosse, WI

"The chicken or the egg...which came first? How do you get experience if you can't get hired?" We've all heard these truisms of life. In today's hectic and pressure-packed work environment, employers are looking to hire the "right person" without having to expend a great deal of time or money to train them for the position. While newer engineers have little to no experience, they do bring a lot of desire and ability to learn.