

Improve efficiency and reduce energy usage in air conditioning systems...

Cooling System Equipment for HVAC

**March 14-16, 2007
Las Vegas, Nevada**

Practical information for

- ▶ *Design engineers*
- ▶ *Plant engineers*
- ▶ *Design-build contractors*
- ▶ *Manufacturers' application engineers*
- ▶ *Related technical personnel*

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**COLLEGE OF ENGINEERING
UNIVERSITY OF WISCONSIN-MADISON**

**Department of Engineering Professional Development
432 North Lake Street Madison, Wisconsin 53706**

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COLLEGE OF ENGINEERING ■ DEPARTMENT OF ENGINEERING PROFESSIONAL DEVELOPMENT

Cooling System Equipment for HVAC

**A practical, in-depth
course where you will
gain expertise in**

- **Cooling system components and their functions**
- **Sizing and selection of components**
- **Analyzing the best options for your application**

**March 14-16, 2007
Las Vegas, Nevada**



Cooling System Equipment for HVAC

March 14–16, 2007 in Las Vegas, Nevada

Save time and money!
Inquire about our on-site courses.
Call 800-462-0876 today!

Understand the Function and Characteristics of Cooling System Components

This practical course will increase your understanding of common cooling system components installed in an HVAC system. The main emphasis will be on the function and characteristic of each main component and how it relates to other components in the system. We will discuss several types of systems for cooling the human or process environment, illustrating the application of each particular component. You will learn:

- Basic system requirements
- Refrigeration concepts
- Chiller characteristics
- Compressor characteristics
- Condenser criteria
- Heat pump applications
- Thermal storage
- Direct expansion system options
- Interrelationship between components
- Control needs
- How part load is met
- Sizing considerations: oversizing, undersizing, energy impacts

Who Should Attend

This course will be very beneficial to

- Plant engineers
- Design engineers
- Design-build contractors
- Manufacturers' application engineers
- Technical personnel responsible for designing, specifying or operating HVAC cooling system equipment

Improve Decision-Making and Selection Procedures

The variety of cooling equipment options in today's market can be overwhelming. This course will provide thorough, in-depth explanation of how cooling components operate, the underlying refrigeration principles that govern their performance, and how to choose an ideal component for your needs.

Engineers, contractors and other technical personnel will learn useful information that will increase their efficiency in designing cooling systems, retrofitting systems, operating systems, or purchasing new equipment. By participating, you will learn to make better selection decisions in less time. Choosing the right equipment will help reduce energy usage and lead to improved system performance.

Learn From Experienced Instructors

The University of Wisconsin–Madison is a world leader in continuing education for technical professionals, specializing in bringing together industry leaders in a proven-effective classroom environment. You will have the opportunity to discuss your particular challenges or successes as you network with your colleagues and these knowledgeable instructors:

Daniel J. Dettmers, Research Engineer, Industrial Refrigeration Consortium, Madison, Wisconsin

At the IRC, Mr. Dettmers provides technical support, applied research and training in the areas of energy efficiency and indoor air quality. His work includes HVAC/refrigeration training, energy audits of commercial and industrial buildings, refrigerant management planning, ammonia refrigeration and refrigerated warehouse construction/operation. He is an active member of IIAR and ASHRAE.

For Related Course Descriptions

<http://epd.engr.wisc.edu/catalogs/HVAC.lasso>

Donald Eppelheimer PE, Senior Application Engineer, The Trane Company, La Crosse, Wisconsin

Since joining the Trane Company in 1972, Mr. Eppelheimer has aided the industry in the analysis and control of HVAC systems for energy efficiency. As an applications engineer, he was responsible for development of HVAC/EMS interface techniques and HVAC system optimization software. He is a member of ASHRAE TC 9.8 "Large Building Air Conditioning Applications" and the Association of Energy Engineers.

David E. Knebel PE, Vice President, Sales and Technology, AAON Inc., Tulsa, Oklahoma

Mr. Knebel's 30+ years of experience in the HVAC industry include HVAC design, consulting, product research and development, mathematical modeling, energy simulation, software development, and teaching. Some of his past activities include market development for HVAC products including rooftop air handling equipment, rooftop packaged equipment, chillers, and water source heat pumps. He has been active in ARI and numerous ASHRAE technical committees.

Earn Continuing Education Credit

By participating in this course, you will receive 2.0 Continuing Education Units (CEU) or 20 Professional Development Hours (PDH).

Cooling System Equipment for HVAC

March 14–16, 2007 in Las Vegas, Nevada

Course Outline

Wednesday, March 14

7:30 Registration

The Riviera Hotel and Casino
2901 Las Vegas Boulevard South
Las Vegas, Nevada

8:00 Welcome and Introductions

Joy E. Altwies PE
Program Director
Engineering Professional
Development
University of Wisconsin–Madison

8:30 Overview of Cooling System Equipment for HVAC

- Fundamental terminology
- Change-of-state processes
- Evaporator/condenser
- Superheat conditions
- Pressure-enthalpy diagrams
- A/C, ventilation and IAQ
- Performance rating measures
- Standard rating conditions

Daniel J. Dettmers
Research Engineer
Industrial Refrigeration Consortium
Madison, Wisconsin

10:00 Break

10:15 The Refrigeration Cycle

- Refrigerants
- Compressors
- Condensers
- Evaporators
- Expansion devices

Daniel J. Dettmers

12:00 Lunch

1:00 Air Conditioning Equipment

- Direct expansion equipment
 - PTAC
 - rooftop
 - condensing units
- Water chillers
 - air cooled
 - water cooled
- Central plants
 - cooling tower
 - air handling units
- Commercial refrigeration
- Industrial refrigeration

Daniel J. Dettmers

2:15 Break

2:30 Class Activity

3:00 Activity Review

3:15 Heat Pumps

- Heat pump basics
- Performance ratings
- Air source
- Water source
 - water loop
 - geothermal
- Geothermal configurations

Daniel J. Dettmers

4:00 Energy Recovery

- “Free cooling”
- Air-side economizing
 - fixed plate heat exchanger
 - run-around loop
 - energy wheels
 - heat pipe
- Water-side economizing
 - plate-and-frame heat exchanger
 - thermosiphon

Daniel J. Dettmers

4:30 Thermal Storage Systems

- Why store “cold”?
- Chilled water storage
- Ice storage
- Other storage methods

Daniel J. Dettmers

5:00 Adjournment

Thursday, March 15

7:45 Coffee/Conversation

8:00 Chilled Water Systems

- Loads
- Heat transfer to chilled water
- Hydraulics and pumping
- System concepts and architecture
- Single chiller systems
- Multiple chiller systems
- Hydraulic decoupling
- High-efficiency configurations
- Combined energy plants
- Heat recovery options
- Plant control
- Condenser water considerations

Donald Eppelheimer PE
Senior Application Engineer
The Trane Company
La Crosse, Wisconsin

10:15 Break

10:30 Centrifugal Water Chillers

- Compressor fundamentals
- Drive-line configurations
- Heat transfer configurations
- Cycle options
- Controls
- Performance
- Selection
- Economics

Donald Eppelheimer PE

12:00 Lunch

1:00 Compressors

- Reciprocating type
- Scroll type
- Hermetic and open
- Compressor ratings
- Full-load performance factors
- Part-load performance
- Refrigerants
- Refrigerant piping

Donald Eppelheimer PE

2:30 Break

2:45 Applied Direct Expansion and Chilled Water Coils

- Inherent efficiency of both coils
- DX coil part-load performance
- Face and row split coils

- Distribution to DX coils
- Control of DX coils
- DX coil circuiting and performance
- Chilled water vs. DX systems
- Control of chilled water coils

David E. Knebel PE
Vice President, Sales and
Technology
AAON Inc.
Tulsa, Oklahoma

5:00 Adjournment

Friday, March 16

7:45 Coffee/Conversation

8:00 Introduction to Package DX Systems

- Equipment available
- Applications
- Rooftop package units
- Single zone units
- VAV zoning units

David E. Knebel PE

9:00 Heat Rejection

- Refrigeration condensing process
- Water-cooled equipment
- Air-cooled condensers
- Evaporative condensers
- Cooling towers: types and performance
- Compressor type needs
- Condensing units
- Heat recovery condensers

David E. Knebel PE

10:15 Break

10:30 Case Studies and Selection Examples

- Manual
- Electronic
- Preventing errors
- Oversizing
- Undersizing

David E. Knebel PE

12:00 Final Adjournment

Please Note: We reserve the right to alter course schedule and substitute speakers when necessary.

Four Easy Ways to Enroll

Need to Know More?

Call toll free **800-462-0876** and ask for

Program Director:

Joy E. Altwies PE
altwies@wisc.edu

Program Associate:

Mary Danielson

Or e-mail custserv@epd.engr.wisc.edu

General Information

Fee Covers Notebook, course materials, break refreshments, lunches and certificate.

Cancellation If you cannot attend, please notify us by March 7, and we will refund your fee. Cancellations received after this date and no-shows are subject to a \$150 administrative fee. You may enroll a substitute at any time before the course starts.

Location The Riviera Hotel and Casino, 2901 Las Vegas Boulevard South, Las Vegas, Nevada. If you must be contacted during a course, phone messages may be left for you at 702-734-5110.

Accommodations We have reserved a block of sleeping rooms (\$119/single; \$119/double plus energy surcharge not to exceed \$3.85 per night) for course participants at the Riviera Hotel and Casino, 2901 Las Vegas Boulevard South in Las Vegas. A deposit equal to the room rate for one night is charged at time of booking. This deposit is refundable if the reservation is canceled 48 hours prior to scheduled arrival. Room block rates are not available for Friday or Saturday night stays. To reserve a room, call 800-634-6753 or 702-794-9412 and indicate that you will be attending the University of Wisconsin-Madison cooling system course under group code UWMAMA7. Room requests made later than February 22 will be subject to availability.

Why Invest in Professional Training?

Whether acquiring continuing education hours or building the skills needed for a promotion, attendees in Engineering Professional Development courses have made lifelong learning a priority in their careers. Professional education benefits you and your employer by offering many opportunities to:

- Refresh and hone your skills
- Discover and share new techniques
- Expand your competencies to new areas
- Step back from your daily grind and refocus
- Connect with experts in the field
- Get fresh viewpoints on your challenges
- Re-energize and “recharge your batteries”
- Set yourself apart from competitors

Bring Your Team

Gain maximum value for your organization by attending as a team. If you enroll three or more people, you will receive a substantial discount.

Enroll online at <http://epd.engr.wisc.edu/webJ038> or call toll free 800-462-0876.

**Save time and money!
Inquire about our on-site courses.
Call 800-462-0876 today!**



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Internet:
<http://epd.engr.wisc.edu/webJ038>

Mail to:

Engineering Registration, The Pyle Center
702 Langdon Street, Dept. 108
Madison, Wisconsin 53706



Fax:

800-442-4214 or 608-265-3448



Course Information

- Please enroll me in **Cooling System Equipment for HVAC Course #J038** March 14–16, 2007 in Las Vegas, NV Fee: \$1195
- Team Discount:** \$1075 each when three or more people enroll and attend together from the same employer
- Lifelong Learner Discount:** Have you completed two or more EPD courses since January 1, 2005? If yes, you qualify for a reduced fee of \$1050 for this course. Please request this discount when enrolling by phone or online. EPD will verify your course attendance records.
- I cannot attend at this time. Please send me brochures on future courses.

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