Ammonia Refrigeration Series

Achieving Energy Cost Savings for Ammonia Refrigeration Systems

May 22–24, 2012
Madison, Wisconsin

- Develop strategies to reduce refrigeration-related energy costs
- Identify methods for improving system energy efficiency
- Validate your efficiency improvements
Achieving Energy Cost Savings for Ammonia Refrigeration Systems
May 22–24, 2012 in Madison, Wisconsin

Practical, Fast-paced Course
Expand your knowledge of energy-efficiency improvements in industrial refrigeration systems! By participating in this practical, fast-paced course, you will gain the information and know-how to identify and implement energy-efficiency improvements in your plant’s industrial refrigeration systems.

Results-oriented Learning Objectives
Four key learning objectives will guide your instruction and enhance your ability to deliver energy savings back on the job:
• Understand factors that influence system energy efficiency and energy costs
• Identify methods for improving system energy efficiency
• Develop an action plan
• Validate your efficiency improvements

Interactive Workshops
Your instructors will mix classroom sessions with interactive workshops and real-world case studies, giving you the opportunity to maximize knowledge transfer and to interact with the instructors and other course participants.

Key Topics for Energy Efficiency
• Single and multi-stage compression systems (overview)
• Compressor and condenser selection, operation and control strategies
• Evaporators and evaporator piping
• Heat recovery options
• Utility rates and rate structures
• Benchmarking systems
• Maintenance considerations

Most of Wednesday afternoon’s instruction and all of Thursday’s will focus in-depth on helping you identify specific energy-saving opportunities for improving your plant’s refrigeration systems.

Who Will Benefit
This course will assist plant engineers, energy managers, utility managers, refrigeration system operators, design engineers, contractors, energy service providers, plant operations staff, consulting engineers, and others interested in improving the energy efficiency of industrial refrigeration systems.

To maximize the benefits from this course, you should understand the basics of industrial refrigeration systems, including refrigerant properties and system component configurations.

We recommend that you bring a laptop or calculator to the course.

Why This Course
Rising energy costs and the dwindling availability of reliable energy sources are major concerns for companies that rely on industrial refrigeration systems for their operation. The surge in energy costs is impacting significantly the bottom line for many companies. Industrial refrigeration systems have come under closer scrutiny since they are one of the single largest consumers of energy in many facilities.

Establishing goals and setting priorities are important preliminary steps in the overall process aimed at achieving more energy-efficient refrigeration systems. However, many owners and operators of industrial refrigeration systems have broader concerns and interests that may include
• Decreasing overall plant energy consumption and energy costs
• Increasing production capability
• Maintaining quality of stored products
• Maximizing capital utilization
• Reducing maintenance costs
• Minimizing environmental impacts and off-site consequences

By helping you to improve the energy efficiency of your refrigeration systems, this course can also enhance many of the above attributes.

Past Participants Say…
“I WILL BE ABLE TO SAVE THE COST OF THIS COURSE IN ONE MONTH.”
Steve Ardiana
Gerber Products

“The ideas I gained should show large savings.”
Thomas Maxwell
Ben & Jerry’s

“I NOW HAVE SEVERAL IDEAS TO INCORPORATE ON FUTURE PROJECTS.”
Peter Brennan
Ancoma, Inc.

“VALUABLE INSIGHT ON ENERGY REDUCTION OPPORTUNITIES. ENJOYED EVERY ASPECT. VALUE FOR THE TIME SPENT.”
B. Ray Chambers
McCain Foods USA, Inc.

Dear Colleague,
Attending this course is your opportunity to identify proven methods to achieve both energy and energy-cost savings in industrial refrigeration systems.

Douglas Reindl
Program Director

ENROLL ONLINE TODAY! Or visit our Web site
Achieving Energy Cost Savings for Ammonia Refrigeration Systems  
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Course Outline

Tuesday, May 22
8:00  Registration/Coffee  
The Pyle Center  
702 Langdon Street  
Madison, WI  
8:30 Welcome  
Douglas T. Reindl  
Professor, Engineering Professional Development  
Director, Industrial Refrigeration Consortium  
University of Wisconsin–Madison  
8:45 Refrigeration Systems Overview  
• Basic single stage compression systems  
• Evaporator configurations  
  – direct expansion  
  – flooded  
  – liquid overfeed  
Douglas T. Reindl  
9:30 Break  

9:45 Refrigeration Systems Overview (continued)  
• Multi-stage compression systems  
  – direct liquid expansion  
  – indirect liquid expansion  
• Preview of energy conservation measures  
Douglas T. Reindl  
10:15 Compressors and Compressor Performance  
• Technology alternatives  
• Interpreting compressor maps  
• Correcting for actual compressor application/operation  
• Factors influencing performance  
  – off-design operation  
  – unloaders and part-load performance  
  – economizers and side-port loads  
• Oil cooler heat rejection methods (screw compressors)  
Douglas T. Reindl  
12:00 Lunch  
1:00 Compressor Selection and Operation–Workshop  
Douglas T. Reindl  
2:00 Break

2:15 Methods of Heat Rejection  
• Air-cooled condensers  
• Water-cooled condensers  
• Evaporative condensers  
• Performance characteristics  
• Control strategies  
• Influence on system performance (capacity and efficiency)  
• Dry operation  
Douglas T. Reindl  
3:30 Heat Recovery Options  
• Heat recovery potential in ammonia systems  
• Recovering superheat  
• Recovering heat otherwise sent to the evaporative condenser  
• Heat exchanger options  
• Control scenarios  
• Cost-effectiveness of heat recovery: trade-off in head pressure vs. other heating sources  
• Oil cooler heat recovery  
Douglas T. Reindl  
5:00 Adjournment

Wednesday, May 23  
7:45 Coffee and Conversation
8:30 Utility Rates and Rate Structures  
• Overview  
• Rate structures  
  – flat rates  
  – time-of-use  
  – seasonal rates  
  – real-time pricing  
  – ratchets  
• Influence of deregulation on rates  
• Gas rates  
Daniel J. Dettmers  
Research Engineer, Industrial Refrigeration Consortium  
University of Wisconsin–Madison  
9:30 Break  

9:45 Performance Analysis  
• Measures of performance  
• Performance measurement techniques  
• System modeling  
• Billing analysis  
• Benchmarking  
Daniel J. Dettmers  
11:00 Break  

9:45 Performance Analysis (continued)  
• Measures of performance  
• Performance measurement techniques  
• System modeling  
• Billing analysis  
• Benchmarking  
Daniel J. Dettmers  
11:00 Break  

11:15 Case Studies in Energy Efficiency Improvements  
Todd B. Jekel  
Assistant Director, Industrial Refrigeration Consortium  
University of Wisconsin–Madison  
12:00 Lunch

1:00 Billing Analysis/Utility Rate Workshop  
Daniel J. Dettmers  
2:30 Uncovering Energy-Saving Opportunities (continued)  
• Creating a recipe for success  
• Floating head pressure control  
  – Why float head pressure?  
  – What are the limitations?  
• Condenser sizing and selection considerations  
  – case studies  
Douglas T. Reindl  
5:00 Adjournment

Thursday, May 24  
7:45 Coffee and Conversation  
8:30 Uncovering Energy-Saving Opportunities (continued)  
• Compressor control  
  – recips vs. screws  
  – fixed vs. variable volume ratio  
  – selection considerations  
  – sequencing and control in multi-compressor systems  
Douglas T. Reindl  
9:30 Break  

9:45 Uncovering Energy-Saving Opportunities (continued)  
• Compressor control  
  – recips vs. screws  
  – fixed vs. variable volume ratio  
  – selection considerations  
  – sequencing and control in multi-compressor systems  
Douglas T. Reindl  
11:00 Uncovering Energy-Saving Opportunities (continued)  
• Thermal energy storage  
Douglas T. Reindl  
12:00 Lunch  
1:00 Uncovering Energy-Saving Opportunities (continued)  
• Multi-stage systems  
  – Is there an optimum interstage pressure?  
  – If so, how do I determine it?  
  – Maintenance considerations  
Douglas T. Reindl  
2:15 Next Steps  
• How/when to implement  
• Validation/verification  
• Continuous improvement  
Douglas T. Reindl  
3:00 Open Discussion  
3:30 Final Adjournment
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