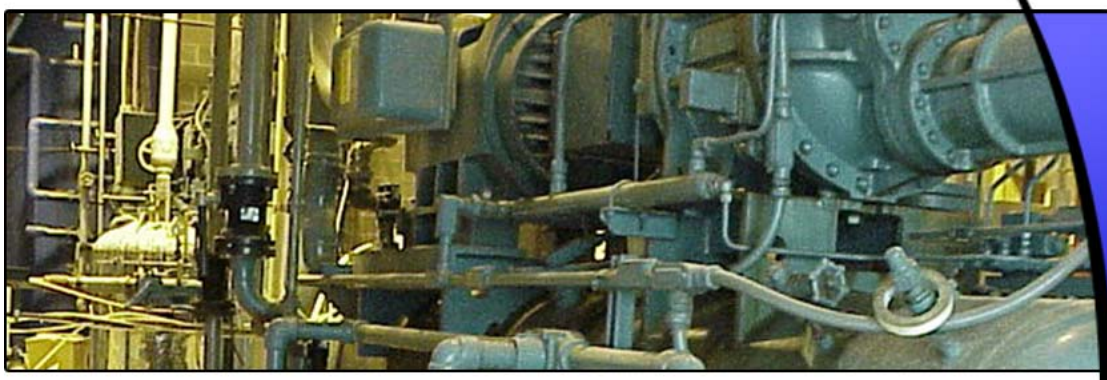

Advanced Refrigeration Systems for Operators

A web-based course conducted by the Industrial Refrigeration Consortium

Industrial Refrigeration Consortium
www.irc.wisc.edu

Advanced Refrigeration Systems for Operators

This class will further extend and hone the skills of operators acquired at the introductory and intermediate levels. Due to the advanced nature of the class, this course material is suitable only for those individuals who have mastered the material covered in the previous two courses and the fundamental abilities necessary to estimate the energy efficiency of a refrigeration system and its components.

A typical course outline is provided below, but can be modified to meet your plant's/company's specific training needs. The course is taught in six sessions that are 2 hours in length. If desired, an examination can be administered to participants upon completion to validate their comprehension of the material.

Advantages of E-Learning

In its quest to provide companies with affordable and unified training for operators, the IRC has refined its development of web-based training. Some of the advantages include:

- Training is delivered live by qualified instructors.
- A uniform training program can be delivered to all operators across multiple plants.
- Eliminates travel costs for both students and instructors.
- Can be tailored to your company's training needs.
- Session can be recorded and played back at a later date.
- Students have multiple ways to interact with instructor both during and after class.
- Homework and exams are to verify their level of comprehension.

All web-based courses offered by the IRC feature 1 or 2 instructors providing live audio feed over phone lines while participants view slides, documents, images and animations over their internet connection. Participants can interact with the instructors both on-line and by telephone during the course or can contact the instructors after the session has ended. Most courses are taught in 2 to 4 hour segments over several days. This allows participants stay productive within their plants since there is no off-site travel.

These courses are intended to build operator's understanding of refrigeration theory and fundamentals. Our experience has shown that operators with this sounds knowledge make better decisions in their plants-particularly during upset conditions. This foundation of knowledge also makes operators better equipped to receive plant-specific procedure training as required by PSM.

Course Outline

Refrigeration Systems Review

- Single stage systems
  - direct expansion
  - flooded
  - liquid overfeed
- Multi-stage Systems
  - direct
  - indirect

Overview of Your Company's Engineering Specs

- Refrigerant piping materials
  - Grade
  - Wall thickness
  - Temperature requirements
- Refrigerant piping welding
  - Standards
  - Testing
  - Installation inspection
- Vessels

Energy Efficiency Improvements: Benchmarking your system

- Is your system efficient? How do you know?
- Overview of Benchmarking
- Billing Analysis
- Case Study: Bakery Benchmarking

Overview of Utility Rates and Rate Structures

- Overview
- Rate Structures
  - Flat rates
  - Time-of-use
  - Seasonal rates
  - Real-time pricing
  - Ratchets
- Influence of rates on system operating costs

Energy Efficiency Improvement Strategies: Floating Head Pressure

- Why float head pressure?
- How do I float system head pressure?
- What are the limits of lowering head pressure?
- Does my system have an optimal head pressure?

Energy Efficiency Improvement Strategies: Compressor Sequencing

- Review reciprocating and screw compressor performance characteristics
- Part-load operation
- Volume ratio
- Efficient control strategies
- Economized screws
- Effects on efficiency with side inlet ports active

Regulating Valves

- Review of EPRs / BPRs
- When are these used and why?
- How do I set them?
- What is the impact of these valves on liquid surge?

Power Outages

- What happens when power goes out?
- Failsafe control strategies
- When & where to use normally-open and normally-closed valves
- Restarting systems following full and partial outages

Energy Efficiency Improvements: Evaporators

- Refrigerant feed methods
- Moisture sources
- Impact of frost on evaporator performance
- Defrost strategies
  - Timeclock timed defrost
  - Liquid solenoid timed defrost
  - Adaptive methods
- Defrost relief valves and their impact on compressor operation
- Alternatives to defrost relief regulators
- Determining capacity of evaporators
- Piping considerations for evaporators: stacked coils with vertical risers

Energy Efficiency Improvements: Multi-staging & Maintenance Impacts

- Single stage or multi-stage?
- Swing systems
- Impact of deferred maintenance on system efficiency

Energy Efficiency Improvements: Implementation & Verification

- How/When to Implement
- Validation/Verification
- Continuous Improvement

Web-based courses currently offered by the IRC

- Advanced Refrigeration Systems for Operators
- Ammonia Awareness Training for Employees
- Intermediate Refrigeration Systems for Operators
- Introduction to Refrigeration Systems for Operators
- Overview of Ammonia Refrigeration Systems

For more information, contact the IRC at info@irc.wisc.edu.

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