BUFFALO TALES

Newsletter of the Manitoba Chapter

The Manitoba Chapter of the American Society of Heating, Refrigerating and Air Conditioning Engineers was chartered in September 1935. It is the second oldest ASHRAE Chapter in Canada. ASHRAE Manitoba is part of ASHRAE Region XI and covers ASHRAE members in Manitoba and Northwest Ontario.

ASHRAE Dinner Meeting
February 7, 2008

Evaporative Condensers for Refrigeration Systems Efficiency and Reliability

Victoria Inn

1808 Wellington Avenue

5:00 pm - Social Hour
6:00 pm - Dinner
7:00 pm – Presentation by Steve Jaczun

Overview

Evaporative condenser maintenance, while not the most glamorous of topics or activities, can pay high dividends to owners of large refrigeration systems. The often forgot large shiny box on the roof above the engine room can have a dramatic effect on the overall efficiency of the system and put an operation out of business if it fails. A small amount of scale on a condenser tube bundle will not only directly affect system performance and increase the overall brake horse power it will also therefore cost the owner money in the form of higher electric bills. An evaporative condenser which is properly sized and maintained can last for decades and provide a very high degree of system efficiency and reliability.

Steve Jaczun is Regional Sales Manager -Industrial Refrigeration for Baltimore Aircoil Company.

President's Message – David Stones, P. Eng.

Our January meeting was well attended for the presentation by Paul Nash on designing for water efficiency in both new and existing buildings. It included some examples of outcomes on completed projects as well details of the operation of dual-flush toilets. We thank Tom Beggs and Johann Baetsen for arranging this.

Planning is continuing for a two-day seminar in April in collaboration with the Building Owners and Managers Association (BOMA), the Building Energy Management Manitoba (BEMM) and the Manitoba Chapter of the Canadian Green Building Council (CaGBC). This is a continuation of the Better Buildings series by

BEMM that has been sponsored by our chapter in the past.

Chapter executive and Committee Chairs have started preparations for reports and attendance at the Chapters regional Conference in May in Edmonton.

I look forward to seeing you on February 7 for the presentation on refrigeration and at the remainder of the meetings this year. I am sure you will find the presentations worthwhile.

ASHRAE Research Promotion Campaign– Stirling Walkes, Chapter RP Chair

The *Research Promotion Campaign* annually raises funds to support ASHRAE's research program. It is conducted by the Society's membership through local chapter volunteers and receives over 7,000 contributions each year from the membership and companies associated with the HVAC&R industry.

Examples of research projects include:

THE EFFECT OF GANGING ON POLLUTANT DISPERSION FROM BUILDING EXHAUST STACKS

Completed March 2007
Cermak, Peterka, Peterson, Inc.
Principal Investigator, Ronald L. Petersen
TC 5.12, Ventilation Requirements and Infiltration

HEAT TRANSFER THROUGH ROLL-UP DOORS, REVOLVING DOORS AND OPAQUE NONRESIDENTIAL SWINGING, SLIDING AND ROLLING DOORS

Completed March 2007
Levelton Engineering
Principal Investigator, Alex McGowan
TC 4.5, Fenestration

Members can submit individual or company contributions directly to ASHRAE Research Promotion, 1791 Tullie Circle, Atlanta, GA 30329 or give contributions to ASHRAE Manitoba's Research Promotion Chair, Stirling Walkes c/o SMS Engineering Ltd. 770 Bradford St. Winnipeg MB. Make cheques payable to *ASHRAE Research* (or *ASHRAE Research Canada*).

2007-2008 Research Promotion Contributors

HydronAire $500

Honour Roll (at least $100 personal or $150 corporate)

Stirling Walkes*	Dieter Bartel*	Russell Lavitt*	Bert Phillips*
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Ammonia: The Refrigerant of Choice for Industrial Refrigeration Systems

Mechanical refrigeration was developed in the 1800s based on the principle of vapor compression. The basic design of the vapor compressor refrigeration system, using ammonia as a refrigerant in a closed cycle of evaporation, compression, condensation, and expansion, has changed very little since the early 1900s. Ammonia was among the early refrigerants used in mechanical systems, and it's the only one of the early refrigerants to secure a lasting role as a refrigerant. Ammonia was first used as a refrigerant in the 1850s in France and was applied in the United States in the 1860s for artificial ice production.

Ammonia refrigeration has been widely used in food processing industry, cold storage facilities, ice rink facilities and also used in chemical industry. Ammonia refrigeration is the most cost effective and energy efficient method of processing and storing frozen and unfrozen foods. Practically all fruits, vegetables, produce and meats, as well as many beverages and juices, pass through at least one facility that uses an ammonia refrigeration system before reaching our homes.

Advantages of ammonia over other refrigerants (Freon)

1. Ammonia has zero ozone depletion potential (ODP) and zero global warming potential (GWP)

   Ammonia is considered an environmentally compatible, natural refrigerant.
   It is not a halocarbon. Ammonia has no effect on the ozone layer. Ammonia, with a life cycle in the atmosphere of less than one week, does not contribute to the greenhouse effect responsible for global warming.

2. Ammonia has superior thermodynamic properties

   Ammonia is 3-10% more efficient than other refrigerants. At the same evaporating and condensing temperature, ammonia has a better coefficient of performance (COP) than R-22. Therefore it is considered that ammonia systems use less electricity than systems with other refrigerants. Therefore, its indirect global warming effect due to CO2 emissions from electric power plants can be considered one of the lowest of all refrigerants.

   Some thermophysical properties of ammonia compared to R-22

   Liquid Density - 0.5 to 1
   Liquid Viscosity - 0.8 to 1
   Liquid thermal Conductivity - 5.5 – 1
   Liquid Specific Heat - 4.0 to 1

3. Lower Operating Cost

   Considering the better thermodynamic properties of ammonia refrigerant, ammonia systems require less primary energy, less refrigerant to produce certain refrigerant effect compare to other industrial refrigerants. The cost of ammonia per pound is significantly less in comparison to all other common refrigerants. All this adds up to lower the operating cost for the food processors and cold storage facility operators resulting lower grocery bills for the average household.

4. Ability to detect in the event of a leak

   Ammonia has easily detectable odor. Therefore the slightest traces of ammonia in the air can be detected. This allows for the safe and immediate repair of system leaks or sources of leaks. Other commonly used refrigerants like the halocarbons are odorless and their escape difficult to detect without mechanical systems. The pungent odor of ammonia will encourage individuals to leave the immediate area of release before harmful concentrations will exist.

   The safety record of ammonia refrigeration is also due to the fact that ammonia is 1.7 times lighter than air and thus easily vented by mechanical means into the atmosphere. If a leak occurs in a refrigeration system under pressure, only the pressurized gas and, absent additional heat, a smaller amount of the liquid in that space will be released. Releases of liquid ammonia are rare. Because ammonia vapor is lighter than air, it will rise and quickly become diluted in the atmosphere. In the presence of moisture, a visible water vapor cloud will form. In contrast, halocarbons are heavier than air and will collect at ground level, displacing oxygen and posing a risk of suffocation.

5. Less chances for explosions

   Ammonia is difficult to ignite and exhibits a narrow range of flammability. The ignition temperature is high as approximately 1,200 F. Ammonia is flammable only at high concentrations and under extremely limited conditions. Because ammonia will not sustain a flame on its own, ignition of ammonia vapor requires an uninterrupted external flame source. Ammonia's burning velocity, at a maximum of 8cm/s, is substantially lower than other flammable refrigerants, and is not high enough to create an explosion. Properly designed ammonia refrigeration systems that are well ventilated and free of open flames or ignition sources mitigate against potential explosion.

6. More tolerant of water contamination

   Small quantities of water in an ammonia system are not detrimental to its operation and filter driers are not necessary as in halocarbon systems. Water mixing with ammonia forms “aqua ammonia” whereby the moisture migrates to the chiller and remains there until

drained. Water in freon-based system will separate from the refrigerant immediately after the expansion valve and can freeze to block the refrigerant flow.

7. More favourable lubricant management

   Most lubricants are immiscible in ammonia and separate out of the liquid easily when the flow velocity is less or when temperatures are lowered. Oil is heavier than ammonia and settles to the bottom of the evaporator (flooded chiller) and into an oil pot where it is readily drained from the system.

One major disadvantage of Ammonia is that it considered toxic at low concentration levels of 35 to 50 mg/kg. It is impossible for a person to remain dangerously long in a seriously contaminated area.

Ammonia is an economical choice for industrial systems. Today there is growing interest in ammonia refrigeration. A well designed, engineered and properly installed and maintained ammonia refrigeration system can last many years.

References:

"Ammonia refrigeration by IIAR(An IIAR green paper), ASHRAE handbook fundamentals -1997 , S. M. Miner "An appraisal of ammonia as an alternative refrigerant " Proceedings, IIAR 1992 , ASHRAE handbook refrigeration 2002

Coming Events

March 3 – ASHRAE Regina Chapter hosts Society President Kent Peterson at the Hotel Saskatchewan, 2125 Victoria Avenue at its supper meeting. Topic is Innovation for a Sustainable Built Environment. Details on registration are given in the attached notice.

March 13 - ASHRAE Manitoba Supper Meeting –Distinguished Lecturer Julian de Bullet

March 26th-27th - "***See the light***.....and learn to think outside traditional boundaries of building systems design". A comprehensive educational event that provides practical and technical information that participants can take back to their offices and apply to their projects. OFFERED BY: Puget Sound Chapters of ASHRAE and IEEE at Seattle University, Pigott Hall.

March, 2008 - Commercial Geoexchange System Design Course, - For details, go to www.mgea.ca or contact Inez Miller at (204) 470-6647 or inez@mgea.ca

April 2 and 3 - eQUEST - Energy Simulation Tool Training. Evaluate today's building technologies … at the speed of today's design process… Day 1 is introduction, day 2 is intermediate training for engineers, architects and other design professionals. Marriott Milwaukee West, Waukesha, Wisconsin. $269/day includes continental breakfast, refreshments, lunch and program materials. Attend both eQUEST trainings for the discounted rate of $429!. For more details, go to http://www.ecw.org/equest

April 16 – Noon - 3:00 P.M. – ASHRAE Satellite broadcast and webcast – "Integrated Building Design: Bringing the Pieces Together to Unleash the Power of Teamwork" explains what you and other members of the building team must do to advance high-performance buildings with improved design, construction and operations processes. Buildings that meet the needs of occupants and truly achieve sustainability objectives can only be created if the building community shares its knowledge and experiences. Learn more about your role in integrated building design and help create a sustainable built environment. Visit www.ashrae.org/IBDbroadcast for information regarding Registration Dates, Frequently Asked Questions, Presenters, and the Broadcast Program.

2008 CRC will be May 7-10, 2008 at the Fantasyland Hotel in the West Edmonton Mall. Golf on May 7th; Technical Seminars on the morning of May 8th, in conjunction with our chapter's bi-annual Tradeshow followed by an orientation session, the first Caucus and Welcome Party; May 9th is meetings, workshops, the President's Luncheon and Dinner Banquet; May 10th is more meetings and workshops, the Awards Luncheon and a Wrap-Up Party. Companion tours include a guided shopping tour of some of Edmonton's most unique and obscure shops, and tours of the local attractions. Registration and accommodation details will be presented as they become available.

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ASHRAE, founded in 1894, is an international organization of 55,000 persons. Its sole objective is to advance through research, standards writing, publishing and continuing education the arts and sciences of heating, ventilation, air conditioning and refrigeration to serve the evolving needs of the public.

Visit ASHRAE Manitoba at www.ashraemanitoba.ca.
Visit ASHRAE at www.ashrae.org.