



The Mulvaney Pipeline

Refrigeration and the use of Carbon Dioxide Gas

Throughout the past decade the need for supermarkets to reduce the HFC refrigerants their use was becoming increasingly clear. By the end of the decade the next generation of Second Nature systems began entering the market and the key to these systems was their use of CO₂. The reasons for moving away from HFCs and to CO₂ were numerous. Foremost among these were environmental concerns that led initially to international agreements (i.e., Montreal and Kyoto Protocols), and then, more recently, to regulatory and statutory actions by the U.S. government (i.e., Clean Air Act and subsequent legislation) and abroad (i.e., European Union F-gases regulations) to curb the use of HCFCs and HFCs. The impact of regulatory pressures on HFC system operators added economic justifications to the move away from their use, as not just the penalties for emissions increased, but the scheduled phase-out of their production added to retailers' costs.

Natural Refrigerants : The overarching need for sustainable approaches to refrigeration has strengthened as these forces upon the market have intensified. European grocers have for some time used different natural refrigerants, including hydrocarbons such as propane, iso-butane, and ammonia. But although these refrigerants have worked well there, for supermarkets here certain aspects of their use provide challenges. Hydrocarbons for instance, can be flammable, and ammonia has long been subject to restrictions on commercial use due to its toxicity. These approaches for North American retailers don't appear to be practical. But another natural refrigerant — CO₂ — does. Carbon dioxide (CO₂/R-744) is colorless, odorless, and naturally available in the atmosphere. CO₂ is produced through natural processes, including the carbon cycle in which it occurs as a product of respiration in animals and from fermentation of organic compounds. It's also produced by other natural phenomenon, including volcanic activity and as a product of combustion, because it is itself nonflammable; it doesn't support combustion.

CO₂ (R-744) Systems : CO₂ as a secondary fluid has been used here in the USA in low and medium-temperature applications. Following on the success of these systems, cascade, or direct expansion (DX) systems have seen increasing use in low-temperature applications. As of 2011, fifteen low temperature CO₂ cascade systems from different manufacturers in U.S. and Canada have been installed with retailers. Most of these systems include glycol secondary refrigeration for their medium-temp applications and they have all been certified under SNAP, UL, and ASHRAE.

How it works: liquid CO₂ absorbs heat in the display case through coils similar to those used in traditional DX systems, but specially designed for use with CO₂. The CO₂ completely evaporates in the coils and the suction gas returns to the compressors. A highly efficient suction-liquid heat exchanger (SLHE) ensures that all of the liquid CO₂ is evaporated before returning it to the compressors. The CO₂ is then compressed and the discharge gas from the compressors is condensed in a condenser-evaporator heat exchanger by the upper cascade of the system that operates in a similar manner to the primary side of secondary system. Liquid CO₂ is then sent to a CO₂ receiver and the SLHE before being distributed back to the liquid supply piping. Significant features of all types of CO₂ systems include the substantial CO₂ charge reductions and the lower leak rates that result due to the HFC piping being entirely contained within the machine room (for what HFCs the systems do use) and factory piped. Supermarkets have also found that both secondary and cascade systems operate at parity or better when compared on energy use with traditional DX systems. Another factor is the lower cost of CO₂ compared to HFC refrigerants. Additional characteristics of all secondary systems include the use of a simple solenoid control, the need for little or no balancing compared to single-phase fluids, and simple commissioning. It's little wonder that CO₂ is receiving the attention that it has.

BEWARE: Brain Eating Amoeba



On October 9, the US Centers for Disease Control and Prevention (CDC) confirmed that the brain-eating amoeba, *Naegleria fowleri*, was found in at least five test sites in a Louisiana public water system. In September, another nearby public waterworks also tested positive following the death of an infected four-year old. Water distribution networks are vulnerable to amoebic contamination where populations of the harmful pathogens can increase where proper chlorine residuals are difficult to maintain.

Since 1962, approximately 130 people in the US had been diagnosed with primary amoebic meningoencephalitis (PAM) caused by *Naegleria fowleri*. PAM is a severe brain infection that can occur after the free-living amoeba enters the human body through the nose. Although infections are still rare, *Naegleria* is known to proliferate at higher water temperatures. Historically, July, August and September are the most likely months for infections to occur. Once infected, the onset of illness is rapid, beginning with symptoms of headache, fever, nausea or vomiting. Initial symptoms occur within about five days of exposure and death after about another five to seven days. Fatal outcomes are preceded by severe brain hemorrhaging and tissue necrosis manifested with symptoms of stiff neck, confusion and seizures. The fatality rate of *N. fowleri* infection is greater than 99 percent. Only two people in the US (California, 1979; Arkansas, 2013) and one in Mexico (2003) have been documented to survive infection. The most recent survivor was a 12-year-old girl, hospitalized for nearly two months after swimming at a water park with a sandy bottom lake. Early detection and a series of experimental treatments are credited with her survival.

Typically, *Naegleria* deaths are traced back to behaviors such as swimming in natural lakes, rivers or other warm bodies of water. According to a Louisiana state health officer interviewed after the recent Louisiana deaths: "Families can take simple steps to protect themselves from exposure to this amoeba, the most important being to avoid allowing water to go up your nose while bathing or swimming. Some cases of *Naegleria* deaths were due to intentional introduction of water in the nose (i.e., via sniffing water during religious practices and neti pots used to flush sinuses) but more often exposure was accidental or incidental. The CDC recommends that potable water intentionally used in the nasal passages should be boiled for three minutes, distilled or bottled sterile or filtered with a one-micron filter.

Increasing temperatures increase the need for maintaining a chlorine disinfectant residual in the water distribution system. The greater the distance from the treatment plant, the greater the likelihood of diminishing chlorine and greater numbers of a variety of bacterial and amoebic pathogens capable of growth in the environment. US water utilities must adopt a more diligent approach to maintaining chlorine residuals in the distribution system.

WHO WAS THOMAS JEFFERSON?



Thomas Jefferson was a very remarkable man who started learning very early in life and never stopped.

- At 5, began studying under his cousin's tutor.
- At 9, studied Latin, Greek and French.
- At 14, studied classical literature and additional languages.
- At 16, entered the College of William and Mary.
- At 19, studied Law for 5 years starting under George Wythe.
- At 23, started his own law practice.
- At 25, was elected to the Virginia House of Burgesses.
- At 31, wrote the widely circulated "Summary View of the Rights of British America" And retired from his law practice.
- At 32, was a Delegate to the Second Continental Congress.
- At 33, wrote the Declaration of Independence .
- At 33, took three years to revise Virginia 's legal code and wrote a Public Education bill and a statute for Religious Freedom.
- At 36, was elected the second Governor of Virginia succeeding Patrick Henry.
- At 40, served in Congress for two years.
- At 41, was the American minister to France and negotiated commercial treaties with European nations along with Ben Franklin and John Adams.
- At 46, served as the first Secretary of State under George Washington.
- At 53, served as Vice President and was elected president of the American Philosophical Society.
- At 55, drafted the Kentucky Resolutions and became the active head of Republican Party.
- At 57, was elected the third president of the United States .
- At 60, obtained the Louisiana Purchase doubling the nation's size.
- At 61, was elected to a second term as President.
- At 65, retired to Monticello .
- At 80, helped President Monroe shape the Monroe Doctrine.

IT HAPPENED 100 YEARS AGO THIS YEAR

- US House of Representatives rejects proposal to give women right to vote.
- Japan claims economic control of China.
- 1st German Zeppelin attack over Great Britain, 4 die.
- Alexander Graham Bell in New York calls Thomas Watson in San Francisco.
- 1st wireless message sent from a moving train to a station received.
- Edward Stone, 1st US combatant to die in WW I, is mortally wounded.
- Pluto photographed for 1st time (although unknown at the time).
- Typhoid Mary [Mary Mallon] is arrested and returned to quarantine on North Brother Island, New York after spending five years evading health authorities and causing several further outbreaks of typhoid.
- Red Sox Babe Ruth pitching debut & 1st HR, loses to Yanks 4-3 in 15 innings.
- SS Lusitania sunk by German submarine; 1198 lives lost.
- 1st transcontinental radio telephone message is sent.
- Ford Motor Company under Henry Ford manufactures its 1 millionth Model T automobile.
- First transatlantic radio telephone message from Arlington, Virginia to Paris, France.
- 25,000 women march in New York City demanding right to vote.
- 1st all-metal aircraft (Junkers J-1) test flown at Dessau, Germany.
- Ku Klux Klan receives charter from Fulton County, Ga.

WHAT THE HECK IS IT?

If you can name the item pictured, you may

WIN A MULVANEY MECHANICAL LEATHER JACKET



If you e-mail your entry, you must write "NEWSLETTER CONTEST" in the subject line to avoid our SPAM filter. Please mail to janette@mulvaneyinc.com

***JUST LIKE THIS ONE!**



If multiple correct answers are received, a winner will be selected at random.

This is a tool whose time has passed. There was a time not too long ago when men never left the house without their hat. The men's hat business was a very big industry that catered to a wide variety of styles. The pictured item is a hat measuring tool from that era.



We received five correct answers
Cornelius Alexy of Alexy Ultrasonics Corp
M. Augustus Ryer of Ryer Associates
Harvey M. Kramer, MD
Andy Dotter of Consulting Engineering Services
Mack Henriques of Praxair, Inc

The final winner of the jacket will be selected at random

WHAT'S GOIN' ON?

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| Mar 08- 12, 2015 | MCAA Annual Convention | Wailea, HI |
| Mar 16- 19, 2015 | ACCA Convention | Grapevine, TX |
| Mar 22- 25, 2015 | IIAR Conference and Show | San Diego, CA |
| Apr 16- 18, 2015 | NEBB Annual Conference | Honolulu, HI |

*The IRS!
We're Not
Happy Until
You're Not
Happy!*



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