REFRIGERANT FADEOUT

With the changeover from HCFC-22 (aka R-22) about seven months away, the reasons for upgrading and the pricing for R-22 will both be on the upswing. Yet, the old standby seems poised to linger even as LEED credits and new equipment point toward newer options. See how design engineers assess the phaseout, what manufacturers are doing to stay current, and where to find other resources.

BY CAROLINE FRITZ

Next year marks an important milestone in the Montreal Protocol.

On January 1, 2010, the production and import of HCFC-22 (also known as R-22 or Freon®), and HCFC-142b for newly manufactured equipment will stop in the U.S., and production and import limits will be set at a level for servicing existing equipment. What does that mean for chiller owners?

A BIT OF BACKGROUND

The Montreal Protocol on Substances that Deplete the Ozone Layer was ratified by the United States in 1988 and led to an amended Clean Air Act. Title VI, Stratospheric Ozone Protection, in the Clean Air Act, provided a schedule in which to phase out HCFC production and consumption in the U.S., starting with those substances that have the greatest ozone depletion potential or ODP. The plan calls for an incremental decrease in HCFC consumption and production, with a complete phaseout by 2030.

Class I ODPs were phased out by January 1, 2000. On January 1, 2003, HCFC-141b was banned. At the 19th meeting of the Parties in Montreal, held in September 2007, a more aggressive phaseout schedule was agreed on, and the consumption and production reduction percentage was increased from 65% to 75% in developed countries.

According to the EPA, further phaseouts beyond 2010 include a ban on the remaining production and importation of R-22 and HCFC-142b on January 1, 2020, and a ban on the remaining production and importation of all other HCFCs on January 1, 2030. Exemptions exist for both future phaseout dates and include HCFCs used in "processes resulting in their transformation or destruction and the preauthorized importation of HCFCs that are recovered and either recycled or reclaimed," according to the EPA.

In December 2008, the EPA introduced two rules to clarify the phaseout schedule. The first rule sets HCFC product and import limits to meet the 2010 caps as follows: 2,920 ODP-weighted metric tons for consumption and 2,646 ODP tons for production. This would reduce allocations for both HCFC-22 and 142b and would set consumption and production allowances for HCFC-123, HCFC-124, HCFC 225ca, and HCFC-225cb; these refrigerants are currently not part of the allowance system.

The second rule proposed by the EPA, the Pre-Charged Appliances Rule, would ban the sale or distribution of precharged A/C and refrigeration products and components containing HCFC-22, HCFC-142b, or blends of these beginning January 1, 2010. This ban would apply to appliances and components manufactured after the target date but not before. This would affect any appliances that use the two refrigerants imported into the U.S.; in 2006, more than 9.7 million precharged A/C and refrigeration appliances were imported (sidebar).

THE GUEST WHO WOULDN'T LEAVE

R-22 is used in packaged A/C units and heat pumps, chillers, and retail food refrigeration. It is also used as a component in refrigerant blends such as R-401A, R-402A, R-409A, and R-502. HCFC-142b or R-142b is rarely used by itself, according to the EPA; it is generally a component in a refrigerant blend.

Per EPA guidelines, and as stated above, R-22 will still be available until 2020 for servicing equipment through EPA-certified reclamation programs. According to David Diggs, global business director for Hon-

eywell Refrigerants, the EPA is relying on these reclamation programs to fill this need for R-22. Honeywell has such a program through its wholesalers and distributers, Diggs said. "We are improving the program with smaller cylinders, which are easier to handle," he said.

Craig Thomas, business manager for refrigerants for Arkema North America, said that his company recognizes the need for reclamation. "We understand the economics of refrigerants, and we work with our customer base," he said.

While some owners may be reluctant to spend the money for new equipment, others may have an impetus as they pursue LEED® certification. The result is a straddling of both worlds.

This has been Kevin Dickens' experience. Dickens, a professional engineer and deputy director specializing in mission critical design for Jacobs Global North America – Design Practice, said that although R-22 is heading for a phaseout, it isn't going away anytime soon. "I have experienced no pushback from owners, only sales pitches from equipment manufactures that R-22 will be around as long as I need it to be. I work primarily with the government and large commercial, and they usually want R-22 out if for no other reason than to get their LEED® points."

"This phase-out of R-22 (HCFC) is a plus for building owners trying to get LEED certification," agreed Stephen Geer, E.I.T., Shaffer • Baucom Engineering & Consulting. "LEED NC v2.2 - EA Credit 6 requires that no CFCs, HCFCs, and halons be used in fire-suppression systems."

This has been the trend on the manufacturing side, said John Mandyck, vice president, government and international relations for the Carrier Corporation. "If anything, we have seen an increased interest in sustainability and initiative such as LEED driving the switch to HFC products."

Vince Sakraida, P.E., a senior mechanical engineer with Merrick & Company, said that in his experience there is no measurable resistance to the refrigerant phaseout, but pointed to an Emerson Climate Technologies survey that reveals although everyone is aware of the upcoming phaseout, as of April 2008, only 14% of contractors are exclusively quoting R-410A and 7% are not selling/installing systems with R-410A.[1].

New rules

In December 2008, the EPA published two rules that will restrict the availability and use of HCFCs, including R-22, starting in 2010. The rules, which are designed to work together, "will restrict the availability and use of HCFCs (including R-22) starting in 2010." One proposal would allocate allowances to continue the Montreal Protocol phasedown of production and import of HCFCs. The other proposal would ban the sale or distribution (including import) of pre-charged air-conditioning and refrigeration products and components containing HCFC-22 or HCFC-142b.

Complete information is available on the EPA website at *http://www.epa.gov/Ozone/title6/phaseout/ruleoverview.html.*

Milt Meckler, P.E., president/CEO of Design Build Systems, is not surprised by this finding. "As long as R-22 is perceived as being readily available and/or R-22 equipment is believed to have further useful life expectancy (without downtime concerns) and customer buy-in on the energy saving cost benefits is less than compelling, it remains a difficult upgrade to justify with the pressure on to reduce new purchases until mid-2010, where possible."

FULL STEAM AHEAD

Manufacturers have had R-22 replacement products on the market for years.

In addition to Danfoss' compressor program, the company has a full range of electromechanical products that use R-410A, including themostatic expansion valves, filter driers, and sight glasses pressure controls.

McQuay International has several products that use R-410A, such as commercial and applied rooftop systems, water source heat pumps, outdoor condensing units, and air cooled scroll chillers; R-407A, vertical self-contained units; and R-1341, air cooled screw chillers and centrifugal chillers.

Mitsubishi offers R-410a in its CITY MULTI® VRFZ systems and Mr. Slim® single zone systems.

Johnson Controls offers several alternatives, from its YORK-brand water cooled centrifugal chillers and water cooled screw chillers that use HFC-134a, to its outdoor air cooled single-package units and indoor water cooled self-contained units that use HFFC-410A and 407c.

Lennox has a complete line of R-410A rooftop units and split systems including the Landmark™ rooftop unit suited for retrofits, and the Stratgeo™ rooftop unit line. Its T-Class™ line of large split systems is available only with R-410A.

Carrier has a number of non-CFC products, including the Evergreen® 23XRV chiller, the Aqua Series air cooled chillers, and Weather Series rooftop units feature R134A or Puron® refrigerant, an R-410A blend.

Manufacturers say that switching to a new unit makes economic sense, even if the owner isn't pursuing LEED certification, because the cost of R-22 is rising.

Denise Ernst with Lennox said the company is encouraging customers to choose R-410a units for that reason. "When they learn that R-22 production will be severely capped in 2010 and that the cost of R-22 is already rising, many customers see the wisdom in replacing their 12- to 15-year-old units now," she said. Lennox has a "Total Cost of Ownership" calculator to compare operating costs of older vs. newer units and has a leasing program to reduce the upfront cost of new equipment.

Robert Wilkins, president of Danfoss, Inc. said there are excellent business opportunities right now. "Today's new equipment is substantially more energy efficient and reliable than eqiupment produced 15 to 20 years ago," he said, and for this reason customers should be encouraged to replace aging equipment rather than repair it.

Larry Kouma, director, large-tonnage packaged chillers for Johnson Controls, has seen similar trends in his market. "The HCFC-22 switchover is complete in our large-tonnage chiller marketplace. Customers investing in equipment with a 20- to 30-year life-cycle have taken a proactive approach to regulations and in consideration of the environment," he said.

Paul Doppel, Mitsubishi's director of government affairs, said that information is the key to good decision making regarding the switchover. "On the commercial side, our contractors have not had the problems because they have been learning a new type of system, VRF, so the new refrigerant was just part of the process."

Not only should replacement costs vs. return on investment be considered, incentives are also available to prod building owners. Julian deBullet, director of industry relations for McQuay International says, "Now is the time to do this as a significant amount of rebate and stimulus programs are available to tilt the balance or return on investment toward switching."

Brian Wathen, commercial marketing manager, unitary products for Johnson Controls, agrees. "Various federal and state incentive programs are in place to benefit those who choose to go with environmentally friendly, HFC-410A products," he said.

THE FUTURE OF REFRIGERANTS

There is a growing concern over refrigerants with high global warming potential (GWP), which the EPA describes as how much a given mass of a chemical contributes to global warming over a given time period compared to the same mass of carbon dioxide. "Environmentalists are looking at R-410A and other HFCs as problems because, while their ODP is zero, their GWP is supposedly high," said Mitsubishi's Doppel. ASHRAE, recognizing this concern, recently released a position statement outlining its commitment to natural refrigerants such as ammonia, hydrocarbons, and carbon dioxide.[2] Manufacturers are moving forward in this area and products are in use in Europe.

Kouma said that Johnson Controls has ammonia-based refrigerants in use primarily in industrial applications although its Sabroe ChillPAC water chillers, which use ammonia as a refrigerant, are used to cool Terminal 5 at the Heathrow International Airport in London.

In Europe, directives to replace HFC134a in automobiles by 2011

have spurred advances. Diggs said that Honeywell's HO-1234yf is being used in European car market, as R-410a has been phased out. Arkema has invested in a manufacturing facility to produce R1234rf to meet this goal.

MORE INFORMATION

There is a wealth of information on the R-22 phaseout, and for those with lingering questions, a good place to begin is at the EPA website at *www.epa.gov.* Beyond ongoing coverage at this magazine's website (*www.esmagazine.com*), manufacturers are also keeping their customers up to date.

Danfoss (*www.danfoss.com*) is addressing customer questions through extensive training and collateral material, including product selection guides, said Lisa Tryson, brand manager of The Americas, Danfoss, Inc.

In addition to extensive training classes, Mitsubishi (*www.mrslim.com*) releases training bulletins and technical literature to its contractors and distributors.

Carrier has a dedicated section on its website at Carrier.com that discusses Puron, R-407C, and R-134A refrigerants and plans of linking to an AHRI website under development that will be dedicated to the refrigerant transition, said Mandyck.

At Johnson Controls (*www.johnsoncontrols.com*), customers are routinely updated with in-person and Web presentations and meetings, and the company's sales engineers are backed by factory engineering team focused on equipment conversion and retrofit applications, especially more recently. "We have seen a significant increase in this activity in the last six months, including more requests for retrofitting HCFC-124 centrifugal chillers to a refrigerant without a phaseout date," said Kouma.

McQuay's Refrigerant Resource Center on McQuay.com keeps visitors up to date on the latest information on the HCFC phaseout.

Lennox has an online R-410A information center at LennoxCommercial.com with product details, fact sheets, and press releases. The company, which requires its contractors to pass a test of R-410A before they can purchase units, has developed an online presentation that is designed to explain what they need to know. The presentation is available for building owners and engineers, as well.

Other groups such as AHRI (*www.ahri.org*), ASHRAE (*www.ashrae.org*), and the Refrigeration Service Engineers Society (*www.rses.org*) routinely post information on their websites regarding the latest on the phaseout.

For a complete list of HVACR organizations, visit the *Engineered Systems* website and click through to the Association Links from Industry Links. **ES**

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REFERENCES

1. Emerson Climate Technologies, *www.emersonclimate.com/images/pdf/R-410A%20Survey%206-19-07%20-%20Overall%20Web.pdf.*
2. ASHRAE, *www.ashrae.org/aboutus/page/335.*