

NOVEMBER / DECEMBER 2016

ACCELERATE

ADVANCING HVAC&R NATURALLY

A M E R I C A

Trump's Impact
On NatRefs

p. 20

EPA, Kigali
Analysis

p. 24, 28

Cutting NH₃ at
Henningsen

p. 32

25

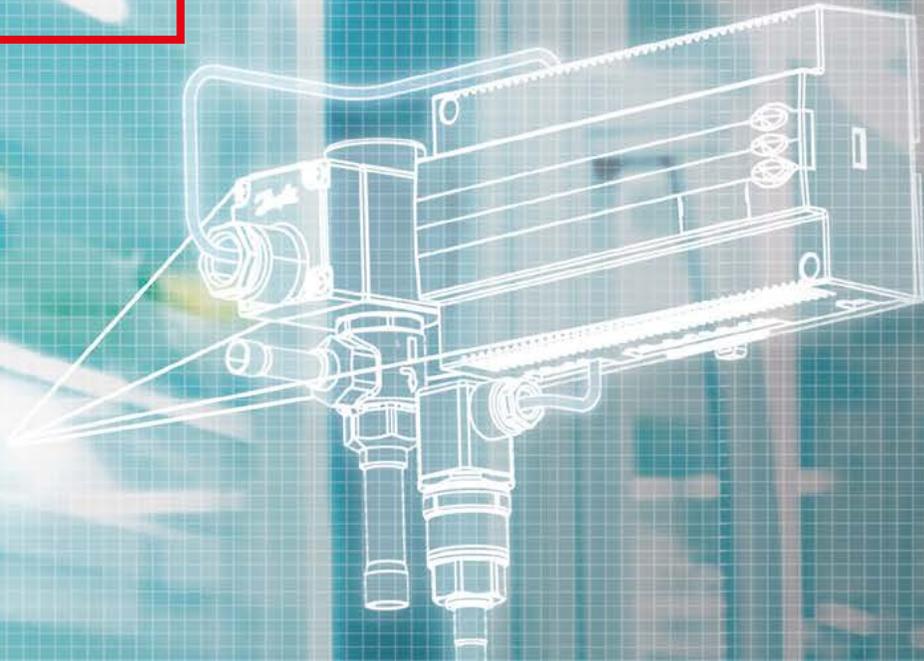
p. 40

**MOVERS
& SHAKERS**

Driving Natural Refrigerant Adoption in North America

+7000

**CO₂ installations
worldwide**



Make your CO₂ project a success – **easy, safe and affordable**

Proven Danfoss technology is backed by more than a decade of leading application expertise and unparalleled customer support.

Today Danfoss is making it easier to adopt natural refrigerants, from designing components to minimize hydrocarbon charges to enabling modular transcritical CO₂ systems with new valves and controllers. Retailers in the US and Canada trust Danfoss experience and expertise to solve their most difficult challenges with solutions like high pressure gas cooler controllers and valves.

Contact us to help make your next project a success

Danfoss LLC Refrigeration & Air-Conditioning

11655 Crossroads Circle
Baltimore, MD 21220

Telephone: (410) 931 8250

E-mail: baltimore@danfoss.com



See how Danfoss is Engineering Tomorrow at
www.food-retail.danfoss.com

**ENGINEERING
TOMORROW**

Danfoss

The Right Side of History

— By Michael Garry

I had a dream about Donald Trump. The former real estate mogul/reality TV star and I were on a plane together and I had the temerity to ask him about climate change. I said, "If 99% of your business advisors told you an investment opportunity was bad, would you listen to them?" And he said, "Of course." So I said, "Then why won't you listen to 99% of the climate scientists who say climate change is real and ignoring it is bad?" Then I woke up.

Back in the real world, the president-elect seemed to soften his climate skepticism in a recent interview with the New York Times, saying that "there is some connectivity" between human activity and climate change, and that he would study the issue "very hard." Meanwhile, his transition team continues to employ Myron Ebell, a notorious climate change denier who is tasked with overseeing changes at the Environmental Protection Agency.

In this year-end issue, we address the historic events that have taken place in the last six weeks – the U.S. presidential election, the Kigali Amendment to the Montreal Protocol phasing down HFCs on a global basis, and the EPA's latest HFC delistings, propane-application approvals and Section 608 changes – and their impact on natural refrigerant adoption.

My initial reaction to Trump's election was to shudder at what his administration would do to hamper progress on the reduction of greenhouse gases – not just fossil fuel emissions but also HFCs. But over the course of November I have come to believe that the situation is fluid and complex, and that the Trump administration will not have free rein to wreck the environment.

For climate change in general, the Paris climate accord, which calls for a scaling down of carbon emissions, has the support of most of the rest of the world. Any country that operates contrary to the accord faces ostracism by the international community.

The same is true of the Kigali Amendment. Though the Trump administration is not as likely to retreat from an HFC phase down, doing so would provoke a global backlash and economic repercussions. Meanwhile our North American neighbors, Canada and Mexico, are pursuing an HFC phase-down agenda.

As for the EPA, as explained in the article on the agency's latest rule changes, it is not that easy to roll back established regulations and protocols pertaining to HFCs and natural refrigerants, though there may be a slowdown in new activity ([page 24](#)). Meanwhile, California, the nation's most populous state, continues its push to phase

down HFCs, setting an example for other states to follow.

Perhaps the strongest defense against a radical setback to greenhouse gas reduction will come from Trump's own backyard – the U.S. business community. When it comes to both clean energy and environmentally friendly HVAC&R technology, too many companies are committed to positive change to be turned back now.

Indeed, our cover story, "25 Movers & Shakers Driving Natural Refrigerant Adoption in North America" offers 25 examples of people and companies who have already made, or are in the process of making, major investments in natural refrigerants ([page 42](#)). They are in no mood to change course.

It really comes down to wanting to be on the right side of history. ■ MG



**We create innovative,
customized and sustainable
refrigeration technologies.**

WE OFFER

–

High technology
Safe systems
Constant reliability
Incredible energy efficiency

WE SERVE

–

Data centers
Supermarkets
Food processing centers
Distribution centers

WE ARE

–

Carnot, leader
in the development of
CO₂ and NH₃ refrigeration
technologies



CARNOT
REFRIGERATION.COM

ACCELERATE

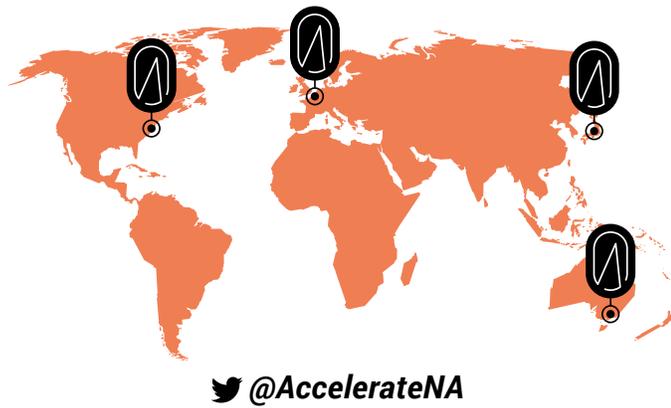
ADVANCING HVAC&R NATURALLY

A M E R I C A

ABOUT ACCELERATE AMERICA

Brought to you by shecco, the worldwide experts in natural refrigerant news, *Accelerate America* is the first news magazine written for and about the most progressive business leaders working with natural refrigerant solutions in all HVAC&R sectors.

<http://acceleraten.com>



28
POLICY
**KIGALI'S
HVAC&R
IMPACT**

03 EDITOR'S NOTE
by Michael Garry

08 INFOGRAPHIC
Impact of EU's F-Gas Regulation on NatRefs Market

10 EVENTS GUIDE

14 IN BRIEF

OPINIONS

16 WHEELS IN MOTION
By Christina Starr

18 THE RESILIENCY OF NATREFS
By Geoff Amos



18



42
TRENDS

25 MOVERS & SHAKERS

Driving Natural Refrigerant Adoption in North America

END USERS

32 FOR HENNINGSEN, LESS IS MORE

38 GOING NATURAL WITH VENDING MACHINES



50
EVENTS
NEWS FROM ACROSS THE POND

POLICY

20 HOW WILL TRUMP'S ELECTION IMPACT NATREF ADOPTION?

24 NEW EPA RULES POINT TOWARD NATREFS

TECHNOLOGY

56 HILLPHOENIX SURPASSES 250 TRANSCRITICAL SYSTEMS

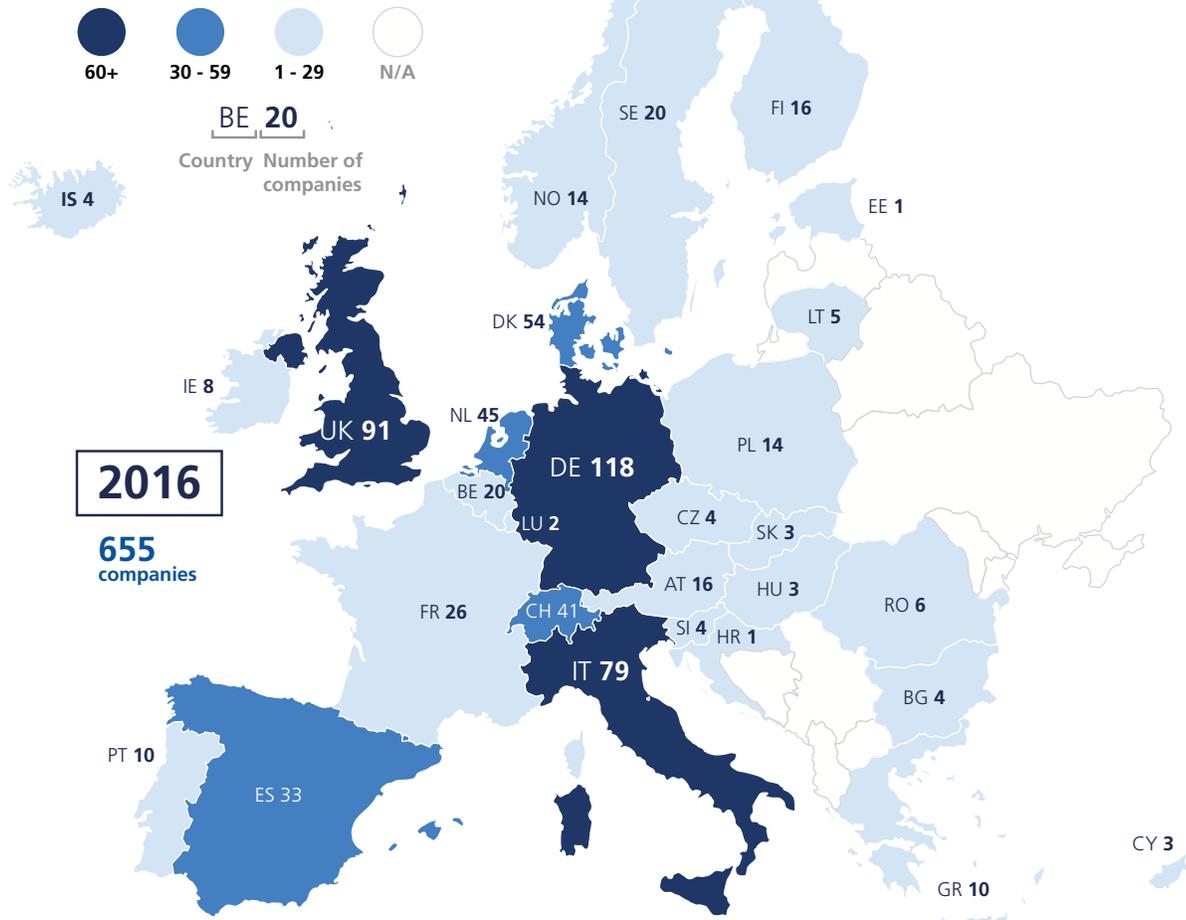
58 THE HILLPHOENIX-ADVANSOR CONNECTION

60 'OUR PLANET - OUR RESPONSIBILITY'



60

Impact of EU's F-Gas Regulation on Natural Refrigerant Market

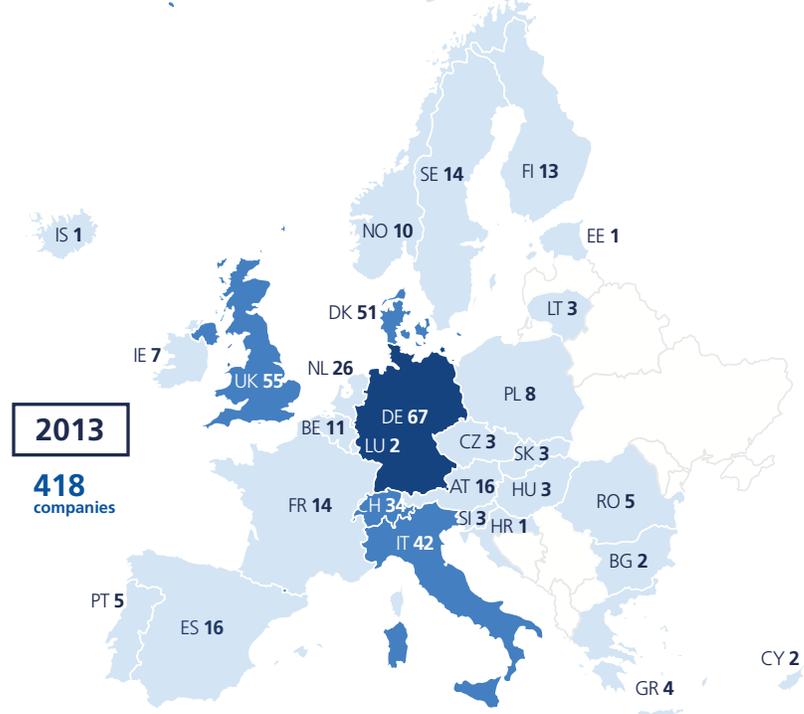


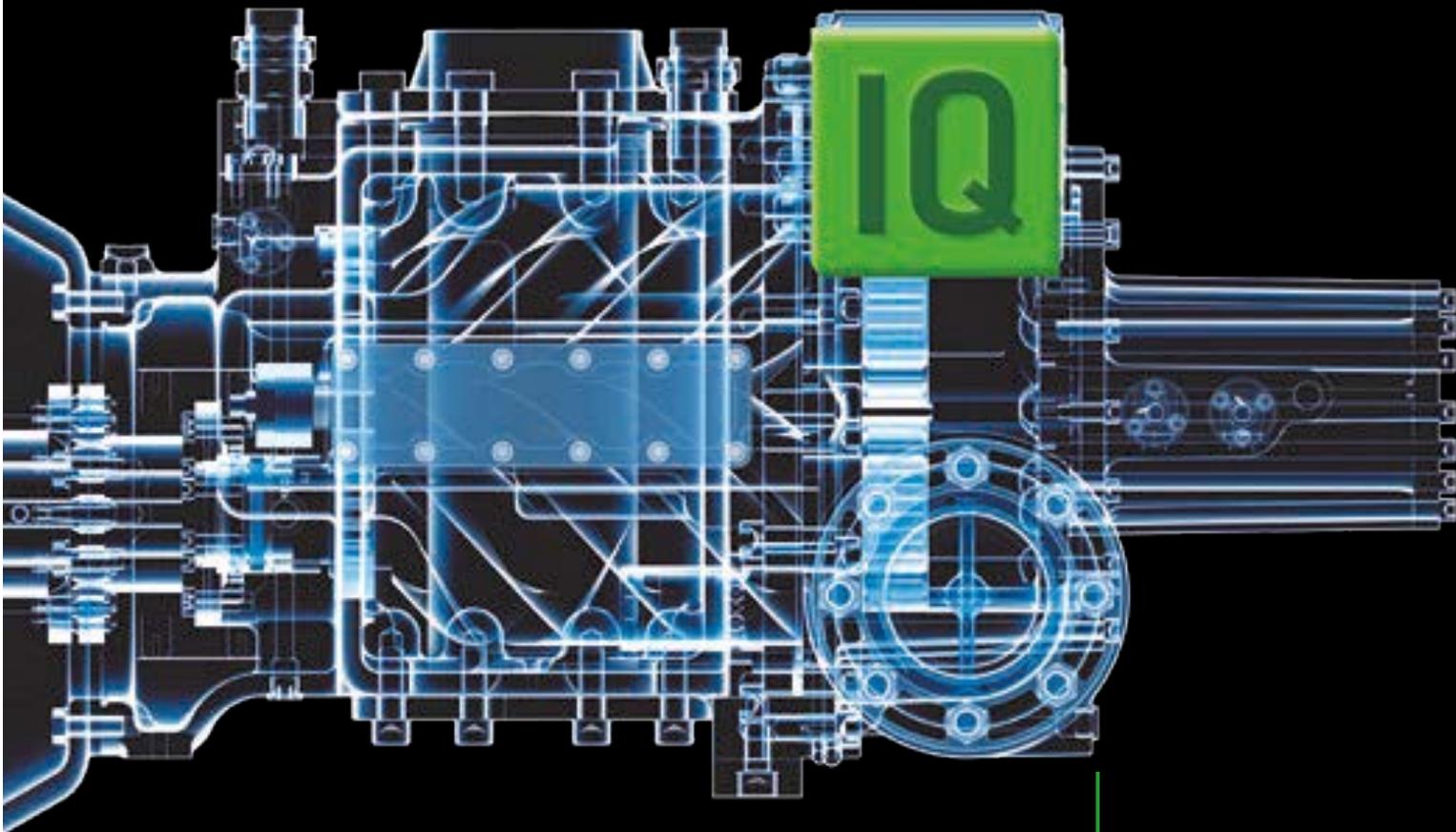
The impact of regulation on the natural refrigerant marketplace can be seen in the European Union's enhanced F-Gas Regulation, which took effect January 1, 2015. Its effect on the number of natural refrigerant component and system suppliers, contractors and service providers is shown here by country, with the total rising by 237, or 57%, between 2013 (when the F-Gas Regulation was on its way) and 2016.

While reasonable efforts were made to account for the number of natural refrigerant companies as accurately as possible, these figures are not necessarily exhaustive and will serve as an estimate of the market.

For a list of countries and their abbreviations, see <http://sustainablesources.com/resources/country-abbreviations/>

Source: *F-Gas Regulation Shaking Up the HVAC&R Industry*, produced by shecco and commissioned by The Greens/European Free Alliance in the European Parliament, October 2016.

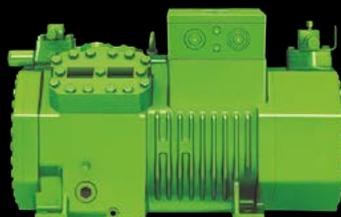




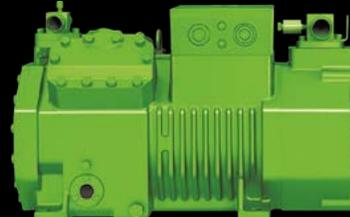
LEADERSHIP IN NATURAL REFRIGERANTS
AMMONIA AND CO₂ COMPRESSORS



OA.S Screw



Transcritical CO₂

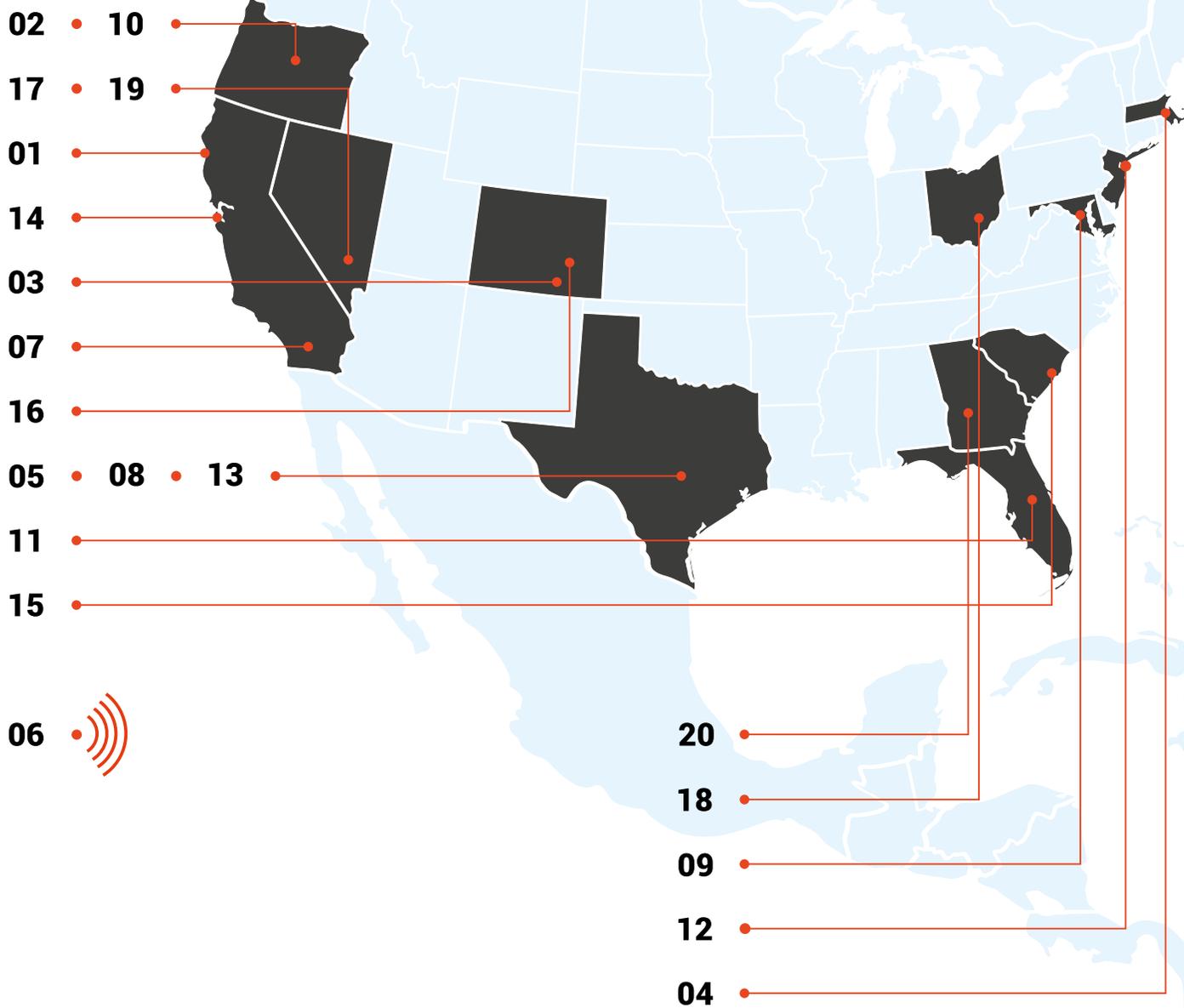


Subcritical CO₂

If you're designing a cascade system for your cold storage warehouse or supermarket, look no further than BITZER for NH₃ and CO₂ compressors. Our OS.A series screws and broad range of subcritical and transcritical CO₂ reciprocating compressors offer an unbeatable combination. Do the math: 0 ODP + 1 GWP = Compliance. Find out more about our products at www.intelligent-compressors.com

EVENTS GUIDE

December 2016 / *January* 2017



- **01** December 1, Santa Rosa, CA
5th Annual North Coast Wine Industry Expo
www: <http://www.wineindustryexpo.com/>
twitter: #WineIndustry #ExpoDeals #WINexpo @WINexpo
- **02** December 1-2, Portland, OR
JLC Live Northwest 2016
www: <https://nw.jlclive.com/>
- **03** December 3-6, Colorado Springs, CO
2016 HARDI Annual Conference
www: <http://hardinet.org/hardi-annual-conference/>
twitter: @HARDInews
- **04** December 5-6, Cambridge, MA
Healthcare & Education Facilities Management Forum - Boston 2016
www: <http://www.forumevents.com/events/Healthcare-Facilities-Management-Forum>
twitter: #IEEEGC16 @IEEEGlobeCom
- **05** December 5-7, San Antonio, TX
10th Global Summit on Food Processing & Technology
www: <http://foodprocessing.global-summit.com/>
- **06** December 6, Online at 2pm EST
GreenChill Webinar-Case Study: Piggly Wiggly's Experiences Using a NH₃/CO₂ System
www: <https://epawebconferencing.acms.com/pigglywiggly/>
- **07** December 6-7, Indian Wells, CA
The 8th Annual NLS Food Quality Symposium
www: <http://www.nextlevelsummits.com/index.php?page=NLS-Food-Safety-Quality-Summit&SummitID=3>
- **08** December 19-21, San Antonio, TX
Clean Air Through Energy Efficiency Conference (CATEE)
www: <http://catee.tamu.edu/home>
- **09** January 9-12, Washington, DC
Building Innovation 2017
www: <http://www.nibs.org/conference2017>
- **10** January 9-11, Portland, OR
Northwest Food and Beverage Manufacturers EXPO
www: <http://www.cvent.com/events/northwest-food-beverage-expo-conference/event-summary-c163e4e7b59b4f6bbf13e2a7606ef828.aspx>
- **11** January 10-12, Orlando, FL
Design & Construction Week 2017
www: <http://designandconstructionweek.com/>
- **12** January 15-17, New York, NY
NRF Retail's BIG Show 2016
www: <http://nrfbigshow.nrf.com/>
twitter: @NRFnews
- **13** January 18-19, Austin, TX
Build Expo - Austin 2017
www: <http://buildexpousa.com/index.html>
twitter: @BuildExpoUSA
- **14** January 22-24, San Francisco, CA
Winter Fancy Food Show
www: <https://www.specialtyfood.com/shows-events/winter-fancy-food-show/>
twitter: #WFFS17 #specialtyfoods @craftcarejoy
- **15** January 24-26, Myrtle Beach, SC
41st Annual Hotel, Motel & Restaurant Supply Show Of The Southeast (HMRSSS)
www: <http://www.hmrsss.com/>
twitter: #HMRSSS @HMRSSS
- **16** January 26- 29, Denver, CO
SIA Snow Show & Sourcing Snow 2017
www: <http://siasnowshow.snowsports.org/>
twitter: #SIA17 @siasnowsports
- **17** January 28- February 1, Las Vegas, NV
ASHRAE Winter Meeting
www: <https://www.ashrae.org/membership-conferences/conferences/2017-ashrae-winter-conference>
- **18** January 29-30, Columbus, OH
Mid-America Restaurant Expo
www: http://www.midamericarestaurantexpo.com/aws/MARX/pt/sp/home_page
twitter: @MidAmResExpo
- **19** January 30- February 1, Las Vegas, NV
AHR Show 2017
www: <http://ahrexpo.com/>
twitter: #AHRExpo @ahrexpo
- **20** January 31- February 2, Atlanta, GA
International Production & Processing Expo
www: <http://ippexpo.com/>

EVENTS GUIDE

February 2017

- **01** February 3-4, Yarmouth, NS
2017 Eastern Canadian Fisheries Exposition
www: <http://www.ecfx.ca/>
twitter: @ECFisheriesExpo
- **02** February 8-9, Vancouver, BC
Cargo Logistics Canada Expo & Conference
www: <http://cargologisticscanada.com/>
twitter: #cargo2017 @CargoLogistics
- **03** February 9-11, Orlando, FL
NAFEM Show
www: <https://www.thenafemshow.org/>
- **04** February 12-15, Las Vegas, NV
The NGA Show 2017
www: <http://www.thengashow.com/>
twitter: #NGAShow17
- **05** February 14-15, Des Moines, IA
AAI 2017 Agribusiness Showcase & Conference
www: <http://www.agribizshowcase.com/>
twitter: @AgribusinessIA
- **06** February 15-16, Los Angeles, CA
Build Expo - Los Angeles 2017
www: http://buildexpousa.com/BuildExpo_LA.html#
twitter: @BuildExpoUSA
- **07** February 20-22, Duluth, MN
2017 Energy Design Conference & Expo (EDC)
www: <http://www.duluthenergydesign.com/>
- **08** February 20-23, Vancouver, BC
Buildex Vancouver 2017
www: <http://buildexvancouver.com/>
twitter: @BUILDEXshows
- **09** February 20-23, Phoenix, AZ
SWBFM 17 - Southwest Buildings & Facilities Management Show & Conference
www: <http://www.proexpos.com/SWBFM/index.php>
- **10** February 22-24, Washington, DC
USBevX 2017 - U.S. Wine & Beverage Expo
www: <http://www.usbevexpo.com/>
twitter: @USBevX
- **11** February 26- March 1, San Antonio, TX
IIAR Natural Refrigeration Conference and Expo
www: https://www.iiar.org/IIAR/WCM/Events/Annual_Conference/WCM/Events/2017_Conference/2017_Program/General_Conference_Page.aspx?hkey=294e9a3c-1d8e-4c95-9afd-837dcfa7b43c
- **12** February 27- March 2, Toronto, ON
15th Cold Chain GDP & Temperature Management Logistics Summit
www: <http://www.conferencealerts.com/show-event?id=178950>



REFRIGERATION TECHNOLOGY for a better world

PROTECTING THE FUTURE WITH NATURAL SOLUTIONS

With increasing global demand for sustainability, natural refrigerant technologies are meeting the world's highest standards for energy efficiency and refrigerant usage. They lower CO₂ emissions, have very low global warming potential and consume up to 45% less energy than hydrofluorocarbons (HFCs). In fact, technologies that use natural refrigerants already comply with new EPA regulations while helping OEMs achieve the Department of Energy's minimum efficiency performance standards for 2017 and 2018.

TO LEARN MORE ABOUT COMMERCIAL REFRIGERANT STANDARDS AND NATURAL REFRIGERANT SOLUTIONS, VISIT [NATURALREFRIGERANTS.INFO](https://www.naturalrefrigerants.info).



embraco

IN BRIEF

CO₂

DANFOSS LAUNCHES MOBILE CO₂ TRAINING UNIT

BALTIMORE, MD. – Danfoss will debut a Mobile Training Unit equipped with CO₂ technology and interactive learning modules that will instruct builders, contractors and technicians worldwide on the natural refrigerant. The unit's first stop will be Danfoss' U.S. headquarters in Baltimore, Md., on January 10, 2017. Danfoss plans to build several training containers that can serve its primary markets in North America, Europe, and Asia. The unit accommodates up to 12 people. More information at:

<http://bit.ly/2g3YI6F>

HYDROCARBONS

AHRI PRESIDENT: A3 STANDARDS TOO STRICT

NUREMBERG, Germany – At the Chillventa Congress preceding the Chillventa trade show in Nuremberg, Germany last month, Steve Yurek, president of the Air Conditioning, Heating and Refrigeration Institute (AHRI), argued that safety standards currently in place in the U.S. for hydrocarbons (flammable A3 refrigerants) are too restrictive. "Safety standards must be modified to ease restrictions on use of [...] A3 refrigerants," he said, adding that hydrocarbons are viable, environmentally friendly alternatives to high-GWP HFCs.

More information at:

<http://bit.ly/2fQFLBy>

AMMONIA

TEACHING THE PUBLIC ABOUT AMMONIA

ALEXANDRIA, Va. – In an effort to educate the general public on ammonia as a refrigerant, the Global Cold Chain Alliance's Ammonia Safety Public Awareness (ASPA) subcommittee is developing "ASPA Facts" documents, said Chairman Jeremy Olberding, vice president of sales, Colmac Coil Manufacturing. Little known by the public, environmentally friendly ammonia is one of the world's most efficient and safest refrigerants, having been in use for more than 150 years, he noted.

CO₂

AWAITING TRANSCRITICAL PROGRESS IN U.S

WEST CHICAGO, Ill. – "We're waiting for the U.S. to begin its long march towards transcritical CO₂," said Tom Schmidt, president of U.S. oil separator manufacturer Temprite. Schmidt perceives "a reluctance by the supermarket industry to move to CO₂ because of cost." However, cost complaints are misplaced because end users "are getting a much better system that solves all of your problems, and you get heat out of it," he said. More information at:

<http://bit.ly/2gxlP6V>

HYDROCARBONS

HYDROCARBONS SEEN FOR BEER COOLERS

NUREMBERG, Germany – Hydrocarbons are expected to replace R404A and R134a in beer coolers worldwide, according to exhibitors at BrauBeviale, an international beverage trade fair that took place in Nuremberg, Germany November 8-10. "Propane compressors are a little cheaper than the alternative," said Burak Türk, area sales manager at Ugur, a Turkish manufacturing group, citing this as a key driver of the adoption of propane in coolers used for beer and soft drinks in supermarkets, bars and concert venues.

More information at:

<http://bit.ly/2fIDClk>

AMMONIA

DX AMMONIA PIPING HANDBOOK RELEASED

COLVILLE, Wash. – Colmac Coil Manufacturing has released the 4th edition of its DX Ammonia Piping Handbook, which covers the design and implementation of low-charge DX ammonia systems from +50°F to -50°F. Using DX ammonia can reduce the evaporator charge by as much as 30 to 50 times compared to bottom-feed flooded or pumped designs, said Colmac. The free handbook can be downloaded at:

<http://bit.ly/2fd1jnH>



for 24 years always cool



PermaCold[®]

Engineering, Inc

*Engineered, Designed and Installed
Refrigeration Systems*

(800) 455-8585

www.permacold.com



our planet, our responsibility

Wheels in Motion

Post-election, HFCs are still on their way out of the U.S. market – and natural refrigerants on their way in – but businesses will need to play their part

–By Christina Starr



The official position of the impending Trump administration on climate change is still unclear, but the business community has been unequivocal about where it stands.

The president-elect and U.S. Congress received a letter this month from over 360 American companies and investors urging continued U.S. participation in the Paris Agreement on climate change and warning, “Failure to build a low-carbon economy puts American prosperity at risk.”

The same holds even more true for the Kigali Amendment to the Montreal Protocol, the global agreement between almost 200 nations finalized in October. The Kigali Amendment sets common deadlines and schedules to begin phasing down hydrofluorocarbons (HFCs), beginning in 2019 for the United States and most other developed nations, with developing countries to follow suit beginning in 2024 through 2028.

This shared global framework sets up a level playing field for companies operating and competing across different markets and it would put U.S. industry at a competitive

disadvantage if the United States were not to participate.

While nothing is definitive yet, what may be even more surprising than the election results could be how little is likely to change with regard to the transition away from climate-damaging HFC refrigerants in the United States. These are a few of the reasons the next four years may not bring as much of a shake-up as you might think:

▶ **The HFC phase-down train has left the station.**

Much like the renewable energy transition, the transition away from HFC refrigerants is already well underway in the United States, with hundreds of millions of dollars invested in research and development of HFC alternatives, including natural refrigerant technologies. Like a fast-moving train, it would be hard to put the brakes on, and doing so would have negative financial implications for companies already investing in replacement refrigerants, components, and systems.

Existing Federal regulations will likely remain in effect.

Despite campaign rhetoric, any administration has limited authority to reverse federal rulemakings that have been signed into law. This includes the recent Environmental Protection Agency SNAP rulemakings on refrigerants, Section 608 rules on refrigerant management (which now cover HFCs for the first time), and the Federal Acquisition Regulation rule for government agencies and contractors to procure more climate-friendly alternatives to high-GWP HFCs.

Since these rules will have already gone into effect when the next administration takes office, reversing them would require either an act of Congress or new rulemaking processes that would include a drawn-out period for notice and comment by stakeholders.

California has a renewed mandate for change.

California is expected to move forward independently, and with continued vigor, on drafting new HFC regulations in 2017. Governor Jerry Brown issued a statement following the election reiterating the state's commitment to addressing climate change as "the existential threat of our time." The state's climate actions will be buoyed by Governor Brown's leadership and by new legislation passed earlier this year (SB 32) that requires the California Air Resources Board (CARB) to achieve 40% reductions in HFC emissions

by 2030. Meeting this goal will mean going well above and beyond the Federal SNAP rules. With a strong and ambitious mandate, California will be the place to watch for continued policy acceleration in the years to come.

The economic downsides of not ratifying the Kigali Amendment are substantial.

Perhaps most importantly, the Kigali Amendment is a legally binding agreement with teeth that was championed by the United States, both its government and industry, for good reason. The next president will be faced with deciding whether and how to ratify the agreement, potentially by sending it to the Senate, though some legal experts argue this is unnecessary because it is an amendment to an existing treaty. Either way, once the Kigali Amendment goes into effect, any country that does not ratify it would be restricted from trading in HFCs with countries that do ratify it under the treaty's "non-party trade provisions."

KEEPING UP THE MOMENTUM

Even with these encouraging factors, champions in the business community will need to play an even more vital role in accelerating uptake of natural refrigerants in the coming years. This means more participation in voluntary groups such as the Consumer Goods Forum, Refrigerants

Naturally!, the North American Sustainable Refrigeration Council (NASRC), and The Natural Voice.

It also means urgent participation in the technical work needed to make natural alternatives viable on a broader commercial scale and in more applications. This could include applying for EPA SNAP approval of a natural refrigerant for a new end-use, funding additional research and testing of equipment using natural refrigerants, or participating in the development of updated standards and codes.

The world will keep moving forward on the transition away from HFCs. But whether America will accelerate adoption of natural refrigerants on pace with other countries and regions will be up to the leaders in the natural business community.

■ CS

Christina Starr is a climate policy analyst with the Environmental Investigation Agency (EIA). Since joining EIA in 2013, she has worked on efforts to advance both domestic and international policies to curb HFCs.

The Resiliency of NatRefs

The natural refrigerants industry in the U.S. has many ways to keep moving forward, regardless of what the new administration does

- by Geoff Amos



From an environmental perspective, it cannot be disputed that the election of Donald Trump as U.S. president is a setback to the Obama administration's trajectory, with which a Hillary Clinton administration would have stayed course.

At this juncture, it is far too early to truly understand the impact the president-elect will have on the U.S. Environmental Protection Agency. For me, the noises made in the days following the election – “the ‘wall’ will be partially fences, there are elements of Obamacare that might be worth keeping, sending Hillary to jail is not sitting in the list of top priorities” – would suggest a softening. This is reminiscent of Brexit, with many of the “victors” quickly toning down their rhetoric when faced with the surprise and reality of actually winning. I hold out hope that this extends to the EPA as well.

As regards the Department of Energy and any attempts to slow down or rescind energy-efficiency regulations that helped the adoption of hydrocarbons in small-charge systems – I don't think this would make the slightest difference.

Propane (R290) is a great refrigerant that has had the opportunity to prove its merits in small-charge

“This is reminiscent of Brexit, with many of the “victors” quickly toning down their rhetoric when faced with the surprise and reality of actually winning.”

applications through massive energy realizations. As a result, Europe has an enormous quantity of small-charge R290 equipment – approximately 10 times that of the U.S. So this one is just common sense, not DOE jurisdiction.

Hopefully the U.S. gets to see these same advantages in larger-charge propane systems in the near future, but we still have many challenges and awareness issues to overcome.

So even if Trump does have a catastrophic impact on the EPA and other agencies, we are fortunate to have many metrics and tools in our arsenal when it comes to natural refrigerants. To name but a few:

- ▶ Be thankful for states like California. As an industry, we need to support California so that it can lead by example and encourage other states to follow suit.
- ▶ You can be a climate-change denier, but that shouldn't necessarily mean you are in conflict with clean energy and improving air quality. It just makes sense.
- ▶ It's worth repeating that, as an industry, we have enough examples out there demonstrating the energy values that natural refrigerants deliver for either commercially acceptable payback periods or even as cost-neutral investments, compared to HFC equivalents. This metric is significant bottom-line value adding, particularly in retail with low margins. It's enough justification in isolation.

EDUCATING THE MILLENNIALS

Another important point is that currently the commercial refrigeration industry is massively low-profile considering the energy it consumes and the greenhouse gas emissions it generates. How do we get wider popular support to ensure that recent events – like the Montreal Protocol's Kigali amendment to phase down HFCs – remain in the public domain?

We hear a lot about the millennials as the biggest demographic and how they are changing shopping trends. This is a generation that shows more consideration for the environment than any other generation that has preceded it. They will make buying decisions based on products' sustainability and environmental impact, so why not on the physical buildings where they are making their purchases?

The refrigeration industry is one step removed from exposure of this kind to the public, but our customers, the retailers, have contact with millions of people every day. It is time we as an industry started to help our customers to better articulate these sustainability messages, so that they in turn can realize the value of marketing in this way to their customers. It may generate more traction with this strategically important generation.

Trump got voted in by making populist promises that he may or may not keep. Our responsibility in this industry is to ensure the benefits of natural refrigerants join the realm of populism. ■ GA

Geoff Amos is director of NRMS Global Limited, a U.K.-based is an engineering, design and technical marketing consultancy working with both grocery retailers and OEMs on natural refrigerant and energy initiatives.

How will **Trump's Election** Impact **NatRef Adoption?**

His administration could roll back environmental regulations that support the uptake of CO₂, hydrocarbon and low-charge ammonia systems, but the advantages of natural refrigerants should continue to attract end users and manufacturers

- by Michael Garry

How will the unexpected election of Donald J. Trump as president of the U.S. impact the regulatory activity of the Environmental Protection Agency, the Department of Energy and other federal agencies – and as a corollary, the adoption of environmentally friendly natural refrigerant systems that use CO₂, hydrocarbons, or low-charge ammonia?

According to Trump's statements during the campaign and before it, he does not accept the science behind climate change (though he has

softened that position), would not support actions taken by the Obama Administration to curb greenhouse gas emissions, and would allow unrestrained production of fossil fuels.

He has also promised to rescind the Obama Administration's Climate Action Plan (which includes HFC reductions) and Clean Power Plan, cancel the U.S.'s commitment to the Paris Climate Agreement (now he says he'll keep an open mind), and scrap regulations he considers unnecessary. The person he has named to lead his EPA transition team, Myron Ebell, director of the Center for Energy and Environment at the Competitive Enterprise Institute, is a noted denier of climate change.

Lowell Randel, vice president, government & legal affairs, Global Cold Chain Alliance, observed that Trump's call to move the U.S. out of the Paris Climate Agreement suggests "there may be a slowdown" of the EPA's HFCs restrictions, which are based on their high global warming potential (GWP).

On the other hand, said Randel, Trump has not talked about the HFC phase-down amendment to the Montreal Protocol agreed to by the U.S. and close to 200 other countries in Kigali, Rwanda, last month.



Moreover, “we have not seen [U.S.] industry oppose [the Kigali amendment]; it appears that industry has prepared for [an HFC phase down] and invested in it. And if there is no loud voice saying this is bad, does Trump want to tackle it? That’s an open question. But it’s not as clear to me that it would be a target.”

A VOLATILE CLIMATE

One executive at a refrigeration manufacturing company, who asked not to be named, acknowledged that if the EPA “loses some of its teeth, supermarkets may be more apt to back off CO₂ adoption.”

On the other hand, he said, it would be “short-sighted” to totally discount natural refrigerants and stick with HFCs, given the volatility of the U.S. political climate. “What if Trump’s a dismal failure and another Democrat comes back to the White House?”

He also pointed out that the state of California has set a determined course to cut greenhouse gas emissions, including HFCs. “California is going to be more emboldened to move forward,” he said. “So for national chains that do business in California, nothing changes.”

In regard to hydrocarbon refrigeration, the Department of Energy (DOE) has had a major impact on the HVAC&R industry during the Obama Administration. In particular, the DOE’s latest energy-efficiency regulation for appliances, which takes effect next March, has helped spark a conversion by many self-contained equipment manufacturers to energy-efficient small-charge propane refrigeration.

Geoff Amos, director, NRMS Global Limited, a UK-based consultancy focused on natural refrigerants, does not think any attempt by the DOE to slow down or rescind its efficiency requirements would “make the slightest difference” to propane adoption. “R290 is a great refrigerant, which has had the opportunity to prove its merits in small-charge applications through massive energy realizations. So this one is just about common sense, not the DOE’s jurisdiction.” (See page 18)

Howell Feig, director of sales, AHT Cooling Systems USA, a manufacturer of self-contained propane refrigeration units, observed that while the Trump administration could possibly slow development, change, and incentives, “it is my opinion that it would not change the course we are headed down.”

AHT, he added, “will continue to be an innovative leader with the use of natural refrigerants and the development of new cases using hydrocarbons, as well as speak to the benefits for retailers and the global community. In my opinion, global consumer demand as it relates to climate change concerns, previous investments and testing should help continue to move the pendulum forward.”

RMP RULE COULD BE TARGETED

Randel of the Global Cold Chain Alliance anticipates that Trump’s “priority on regulatory reform can have an impact on how the industrial refrigeration industry is regulated.”

In particular, he expects the Trump administration to take a look at any of the regulations President Obama releases in the latter stages of his term. One example would be the EPA’s final changes to its Risk Management Plan (RMP) rule, which can apply to ammonia refrigeration; the updated rule is expected to be released before the end of the year, possibly in the next few weeks. “If the industry places enough concern on the final RMP rule, I think you’ll see Trump and maybe Congress looking to use the Congressional Review Act as a way to scrutinize the rule and either disapprove of it or have the Trump administration try to move away from it,” said Randel. He did not indicate whether GCCA would get involved.



“If there is no loud voice saying [Kigali Amendment] is bad, does Trump want to tackle it?”

- Lowell Randel, Global Cold Chain Alliance

REGULATORY PICTURE: NOT THAT SIMPLE

The election of Donald Trump has sparked concerns that he will seek to roll back environmental regulations, but the regulatory picture may be more complicated than headlines suggest.

“While Trump may try to rescind a number of regulations, the process would be long, arduous and only partially successful,” said Jody Freeman, professor of law and founding director of the Environmental Law Program at Harvard Law School, writing in *Harvard Law Today*. “Moreover, any broad legislative attack on environmental statutes is unlikely to succeed without a filibuster-proof majority in the Senate, which the Republicans do not have.”

Rescinding rules that are already final and partially implemented “can be especially difficult to the extent the affected industry already has invested in compliance,” she added. “In such circumstances, the industry itself may resist change because it would suffer additional expense from the uncertainty or volatility posed by rescission.”

On the other hand, Freeman wrote, “it is possible for Trump’s EPA/DOI/DOE, etc, to slow-walk any new or proposed regulations, even if they are required by statute, and to likewise seek to hobble enforcement.”

“Global consumer demand ... should help continue to move the pendulum forward.”

– Howell Feig, AHT Cooling Systems USA

▶ One element of the proposed RMP rule to which the HVAC&R industry objected was the requirement that industrial refrigeration operators get an independent, third-party audit, rather than do an internal audit, within a year of a reportable accident or catastrophic incident.

On the other hand, the RMP changes were not discussed during the campaign and “are not one of Trump’s highest EPA priorities,” Randel said.

A regulatory change to the Occupational Safety and Health Administration’s Process Safety Management (PSM) rule, which will not be completed before the Obama Administration ends, will likely be stalled under Trump. “The pause button will be hit on regulations in that stage of development,” Randel said. “There will be more emphasis on compliance assistance, education and outreach vs. enforcement, enforcement, enforcement.”

However, Randel does not expect Trump to try to roll back the underlying safety elements of the RMP or PSM rules, including the 10,000-lb. ammonia charge threshold for greater scrutiny.

Moreover, he does not believe that any regulatory relief offered by Trump will slow the momentum behind the adoption of low-charge ammonia systems. “There are a lot of reasons to move to low charge; regulatory relief is one but not the only one,” he said. “If you’re planning to put in a new [low-charge] system, this doesn’t change your long-term decision. ■ MG

Shaping Refrigeration Systems for Tomorrow

NewTon

Client Testimonial - Wholesome Harvest Baking (Canada)

The safety is one of the biggest deciding factors for equipment in the baking industry today.



In Ontario, Canada, at the Toronto plant of Wholesome Harvest Baking, (2) NewTon R-6000 units (cooling capacity 54TR) are installed for their spiral freezer.

Frank Barrese P. Eng, Maintenance and Engineering Manager at Wholesome Harvest Baking in Toronto, Ontario, is in charge of ensuring the bakery's safe and reliable operation. He states that one of the biggest deciding factors for them to install NewTon packages was the safety that their low Ammonia charge promised. Although this plant is located in the industrial zone, it is also adjacent to a church that runs a daycare for children. NewTon's Ammonia charge was low enough to be approved by the City of Toronto, whose regulations are much stricter than the ones in the suburbs.

Wholesome Harvest Baking
A Division of Grupo Bimbo



A PRUDENCE MEMBER OF GRUPO BIMBO

Wholesome Harvest Baking is the leading provider of quality frozen and par-baked products to retail operators and in-store bakeries in Canada and the United States. With the purchase of Canada Bread by Grupo Bimbo early in 2014, they are now part of the largest bakery in the world. Grupo Bimbo is present in 22 countries worldwide and have over 100 brands of acknowledged prestige.

"Building a sustainable, highly productive and deeply humane company" is one of the business statements Wholesome Harvest Baking and Grupo Bimbo hold at their core. They are committed to being one of the most socially responsible companies in the world.

1,000 Units Running Worldwide



NewTon R-6000

- ▶ **Energy-saving**
 - State-of-the-art refrigeration technology
 - Semi-hermetic compound screw compressor equipped with a high performance IPM motor
- ▶ **Safe**
 - Minimal self-contained NH₃ system charge
 - CO₂ brine keeps NH₃ out of the work area
 - Certified for the USA and Canada
 - Support via remote monitoring system

MAYEKAWA
MYCOM

www.mayekawa.com
(Mayekawa Global Website)

MAYEKAWA USA (MYCOM)

www.MayekawaUSA.com
info@MayekawaUSA.com
Tel : (800) 806-9266

MAYEKAWA CANADA INC.

www.mayekawa.ca
customerservice@mayekawa.ca
Tel (Vancouver) : (604) 270-1544
Tel (Toronto) : (905) 564-0664

New *EPA Rules* Point Toward *NatRefs*

The agency targets HFCs and HFOs while approving hydrocarbons for new applications, opening a path for greater adoption of natural refrigerants

– By Mark Hamstra

For companies with commercial, light commercial and industrial refrigeration operations, new rules set by the U.S. Environmental Protection Agency, followed by the Kigali Amendment to the Montreal Protocol, have set a clear agenda for the diminishing use of hydrofluorocarbons, or HFCs, and the growing use of natural refrigerant.

Much remains unclear, however, particularly following the election on November 8 of Donald J. Trump as president of the United States. ([See story, page 20](#)) The Kigali Amendment seeks to curb the impact of HFC emissions on global warming ([see story, page 28](#)), a phenomenon President-elect Trump has described as a hoax. Trump has also promised to sharply reduce the capabilities of the Environmental Protection Agency, which decides which refrigerants are acceptable for specific applications and how they are managed, and would be responsible for implementing the rules that would enforce the terms of the Kigali agreement.

However, as matters currently stand, HFCs, both nationally and globally, are on the chopping block, paving a course for environmentally friendly alternatives, particularly natural refrigerants.

The Kigali agreement in October came on the heels of two regulatory updates from the Environmental Protection Agency that also could impact end users' refrigerant options — changes to Section 608 of the Clean Air Act, which regulates refrigerant management practices during the maintenance, service, repair and disposal of refrigeration equipment; and Final Rule 21 of the EPA's SNAP (Significant New Alternatives Policy), which determines acceptable alternative refrigerants as replacements for certain ozone-depleting substances, while delisting some HFCs in specific applications.. ([See "The EPA's Latest Moves," *Accelerate America*, October 2016](#))

The changes to Section 608 become law on January 1, 2017 and go into effect January 1, 2019, while Final Rule 21 becomes law on January 3, 2017, applying immediately to some changes like new applications for propane.

Food retailers see the new rules as a potential boost for natural refrigerant technologies. The changes to Section 608 in particular, could encourage more consideration of natural refrigerants as alternatives. These changes extended HCFC leak-repair and record-keeping requirements to HFCs as well as hydrofluoroolefins (HFOs), but did not impose any new requirements on the use of natural refrigerants such as ammonia, hydrocarbons, and carbon dioxide.

"I would say yes, the new Section 608 changes will give us one more reason to consider natural refrigerants for future projects," said Harrison Horning, director of equipment purchasing, maintenance and energy at the Scarborough, Maine-based Hannaford Supermarkets.

PROPANE FOR MORE APPLICATIONS

One boost for natural refrigerants to emerge from the EPA's Final Rule 21 changes is the expanded roster of applications for which propane (R290) is permitted, including self-contained commercial ice machines, new water coolers and new very-low-temperature refrigeration equipment.

The Final Rule 21 changes could more generally open the door for operators to adopt propane as an alternative to R404A and R134A, which are being disallowed as refrigerants for certain applications. R404A is commonly used as a back-pressure refrigerant in medium- and low-temperature environments, and R134A is frequently employed by supermarkets in self-contained refrigeration units.

"Propane is an excellent chemical to be used in some of these refrigeration applications," said a representative of a large HVAC&R manufacturer.



“I would say yes, the new Section 608 changes will give us one more reason to consider natural refrigerants for future projects.”

- Harrison Horning, Hannaford Supermarkets

“We are seeing almost a 15% efficiency gain on our condensing unit.”

- representative of a large HVAC&R manufacturers

Because the propane charge is limited to 150 grams — about 5.3 ounces — for self-contained refrigeration systems, propane also has some limitations in its applications.

“It can be good for systems up to about half of a horsepower,” said the representative. “Beyond that it is very challenging to get the refrigerant effect that you need with that amount of refrigerant.”

Although propane comes with some additional safety requirements, “R290 is coming,” the representative said. “We do see a lot of small, self-contained merchandisers already moving to the very-low-GWP refrigerants like propane, and we expect that trend to continue.”

A shift toward propane will also mean that the industry will need to invest in training technicians how to maintain and service propane systems, he added.

The representative cited the benefits of propane in terms of its increased efficiency. “It is a great thermodynamically performing refrigerant, and we are seeing almost a 15% efficiency gain on our condensing unit,” he said. “Propane is a great option, no doubt,” he said.

Blupura, an Italian maker of water coolers with U.S. offices in Coral Gables, Fla., has already installed several of its HFC-free water coolers on the East and West Coasts in the U.S. in the wake of the EPA’s propane approval, said Debora Screpanti, marketing manager at Blupura. Propane drives better performance of water coolers, while reducing contributions to global warming, she said.

“The use of natural gases is essential for a sustainable economy, and we all agree on it,” she said, noting that the Kigali agreement supports the efforts of Blupura and other companies in promoting the use of natural refrigerants.

Blupura’s early work with natural refrigerant technologies has given the company an advantage in the U.S. and European water-cooler market, Screpanti said.

“It is just a starting point from where we will continue the promotion of a sustainable environmental culture in new countries,” she said. “This is actually what we are already doing in Australia and New Zealand. Looking at the global market, we are sure that very soon many companies of our industry will move to our same direction, as that’s the only way to get to a better future.”

▶ INDUSTRIAL OPPORTUNITIES

The changes in Final Rule 21 also impact industrial refrigeration options, with some commonly used refrigerants – R404A, R507A and others – becoming delisted and deemed unacceptable after Jan. 1, 2023.

A high percentage of industrial refrigeration applications already use ammonia, including a growing number of low-charge systems, which along with CO₂ could be used in place of HFC-based systems.

Joe Sanchez, engineering manager at Flowery Branch, Ga.-based Bitzer US, a maker of compressors and other refrigeration technologies, said that the SNAP changes will help perpetuate the use of natural refrigerants in large systems at cold-storage facilities. He cautioned, however, that HFC solutions will remain attractive to some cold-storage operators because of what he described as “painful” restrictions on large quantities of ammonia.

He said the delisting demonstrates that the EPA is interested in restricting the use of F-gases in applications that have predominantly featured low-GWP refrigerants. “For smaller subsystems, like condensing units, this will certainly start to accelerate the shift away from R404A and R507,” Sanchez added.

He said Bitzer will continue to offer a range of solutions to meet the needs of its customers.

“We have been targeting CO₂, NH₃, and other low-GWP solutions since even before 2000,” he said. “So in that respect, we will continue with our approach to be flexible for our customers in providing high-quality products that meet all of the changes in refrigerants or applications.” ■ MH



“For smaller subsystems, like condensing units, this will certainly start to accelerate the shift away from R404A and R507.”

- Joe Sanchez, Bitzer US

KEY SECTION 608 CHANGES

- Extension to HFCs/HFOs
- Trigger leak rate for commercial repairs: 20%
- Quarterly inspections



THE UNDISPUTED LEADER IN NATURAL REFRIGERATION SYSTEMS



Standard and custom low charge Packaged Refrigeration Systems for industrial refrigeration, process cooling, and HVAC applications • Less than 1 pound/TR • Natural, environmentally friendly options (0 ODP, 0 GWP) • Energy efficient Engineering and PSM services • Nationwide parts, service, installation

28th Meeting of the Parties to the Montreal Protocol
10 - 14 October 2016, Kigali, Rwanda

DUBAI PATHWAY
ON HFCs

KIGALI's HVAC&R Impact

In addition to helping the global effort to curb climate change, the phase down of HFCs accepted by the parties to the Montreal Protocol offers welcome certainty to the industry – as well as a unique opportunity for natural refrigerants

– By Mark Hamstra

On its face, the Kigali Amendment to the Montreal Protocol adopted in the Rwanda capital on October 15 marks a long-awaited breakthrough in the battle to control greenhouse-gas emissions and prevent catastrophic levels of climate change. But it also offers a rare opportunity to the natural refrigerants industry.

The October consensus agreement among 197 nations calls for the phase down of HFCs, which contribute significantly to global warming, as a follow-up to the phase down of CFCs and HCFCs previously established by the Montreal Protocol.

The HFC phase-down schedule is calculated to avoid more than 80 billion metric tons of carbon dioxide-equivalent emissions by 2050—preventing up to 0.5° Celsius warming by the end of the century—while continuing to protect the ozone layer.

“This is a big deal because our scientists say very clearly that we cannot see our planet’s temperature rise above two degrees [Celsius] from our normal temperature,” said EPA Administrator Gina McCarthy.

The HFCs specifically targeted by the Kigali amendment include the following: R134, R134a, R143, R245fa, R365mfc, R227ea, R236cb, R236ea, R236fa, R245ca, R43-10mee, R32, R125, R143a, R41, R152, R152a, R161 and R23. Some of these HFCs are also components of commonly used HFC blends like R404A and R410a, which are also covered under the amendment.

In addition to serving as a partial remedy for global warming, the Kigali Amendment has provided the HVAC&R industry around the world with a clearer picture of the ultimate fate of HFCs; more than ever, equipment manufacturers and their customers will need alternatives to HFCs, providing a rare opportunity for natural refrigerants to step into the breach.

The Kigali amendment will take legal effect as early as January 1, 2019, if at least 20 countries have ratified it by then, or latest on the 90th day after ratification by 20 countries. While in previous

amendments to the Montreal Protocol, Senate approval was needed to secure U.S. participation, a spokesperson for the State Department said it had not yet determined what the approval process for the amendment would be.

“We will need to examine the amendment, as well as relevant practice, in order to determine the appropriate approval process,” the State Department said in a statement emailed to *Accelerate America*. “At the moment, we are still awaiting the final text.”

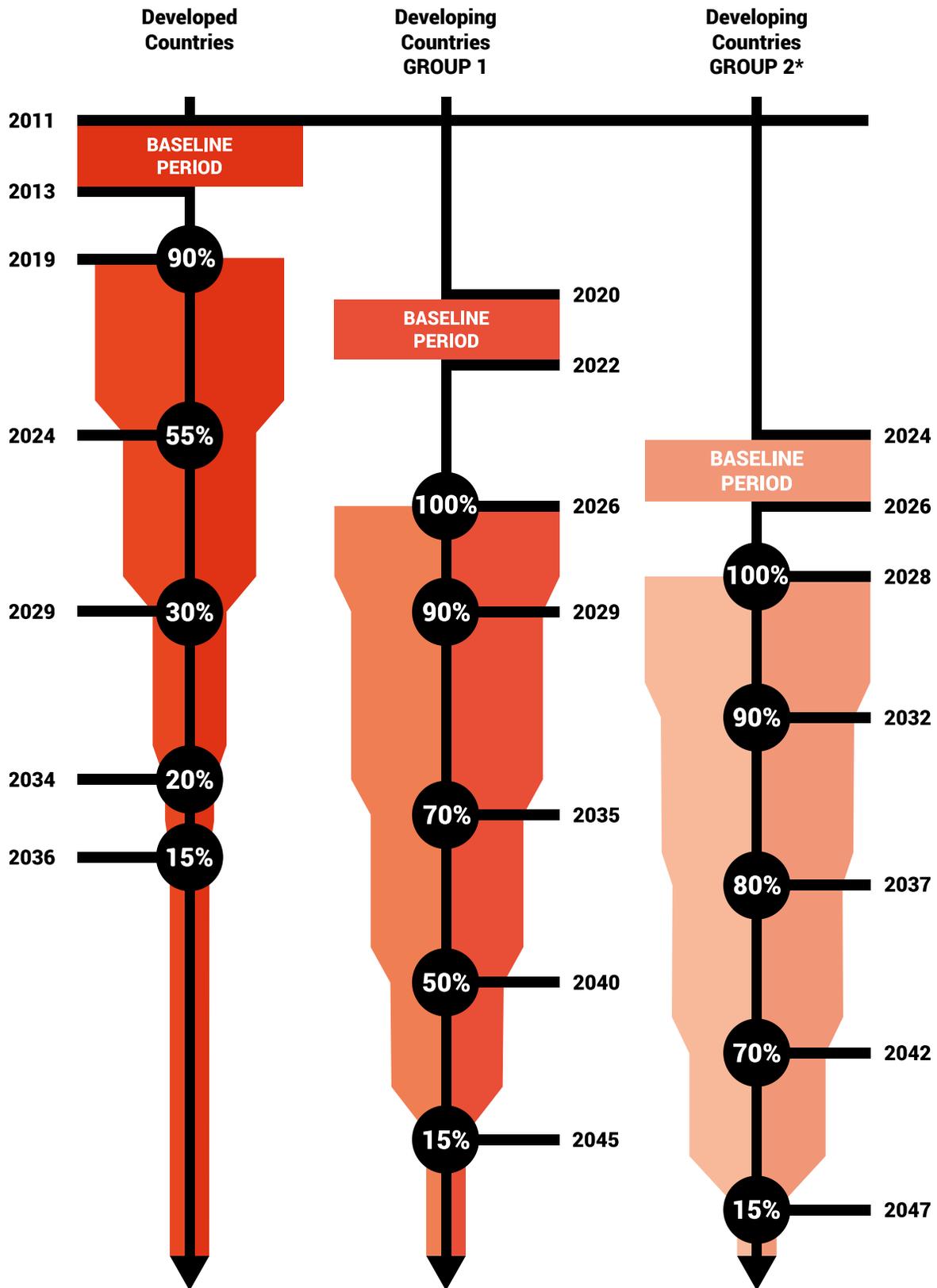
A statement by the Obama Administration noted that the original Montreal Protocol was the first treaty in the history of the United Nations to be achieve universal ratification “and we expect such broad participation to continue under the amendment to address HFCs.” The amendment’s provisions that restrict trade in HFCs with non-parties “will act as a powerful incentive for all parties to join,” the statement added.

An executive with a refrigeration manufacturer said he expected the U.S. to remain onboard the Kigali Amendment. “Otherwise, the U.S would be out there on an island by itself.”

The Kigali amendment asks developed (Article 2) countries such as the U.S. to take the lead in phasing down HFCs, starting with a 10% reduction in 2019 and culminating in an 85% cut by 2036 (compared to a 2011-2013 baseline).

Developing (Article 5) countries are split into two groups. The first one – which includes China and African nations – will freeze consumption of HFCs by 2024, with their first reduction steps starting in 2029, and consume no more than 20% of their 2020-2022 averaged baseline by 2045. A second group including India, Iran, Iraq, Pakistan and the Gulf countries will freeze their use of HFCs in 2028, begin reducing consumption in 2032, and consume no more than 15% of their 2024-2026 averaged baseline by 2047.

Kigali Amendment's HFC Phase-Down Schedule: Percent of Baseline



* India, Iraq, Iran and the Gulf States

“This is a great milestone which creates more certainty for industry.”

– Jurgen Fischer, Danfoss Cooling

▶ INDUSTRY REACTION

Key parties in the HVAC&R industry have welcomed the Kigali agreement.

Refrigeration component maker Danfoss said it “applauds the negotiating parties of the Montreal Protocol and their accomplishment,” adding that Danfoss is “well positioned to help our customers transition to low-GWP refrigerants before the Montreal Protocol [HFC] phase-down deadlines.” The company, based in Nordborg, Denmark, pointed out that there are more than 7,000 ultra-low GWP CO₂ refrigeration systems using Danfoss products in operation today.

“This is a great milestone which creates more certainty for industry,” said Jurgen Fischer, president of Danfoss Cooling.

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI), based in Arlington, Va., also lauded the Kigali agreement. “While the freeze dates and step-down levels are ambitious, the HVACR industry is confident we can meet them and continue to provide quality, innovative, energy efficient products and equipment for the benefit of the world’s citizens,” said AHRI President and CEO Stephen Yurek, who attended the Kigali meeting.

“The agreement is just the first step in a multi-step process,” Yurek continued. “Our industry is hard at work doing the research on the HFC alternatives that will be used in the world’s air conditioners, heat pumps, and refrigeration equipment, and getting that right is certainly as important as reaching agreement. Also very important are the education and training initiatives that will have to occur to ensure safe, efficient installation of the equipment that will contain these new refrigerants.”

A major question still facing manufacturers is whether to promote natural refrigerants over HFOs as an HFC alternative.

“We have to take a position and tell our customers what we think,” said Giovanni Dorin, marketing director for compressor maker Dorin. “We say that CO₂ [...] is the real solution” alongside hydrocarbons and ammonia for certain applications. HFOs, meanwhile, are little more than “a temporary alternative” to natural refrigerants.

In terms of efficiency, Green Cooling, a U.K.-based engineering consultancy, contends that “natural refrigerants are inherently more energy efficient” than “synthetic refrigerant-based technology.”

One factor that may ultimately hamper the widespread use of HFOs as an alternative to HFCs is that HFOs like 1234yf break down in the atmosphere to produce trifluoroacetic acid (TFA) to a much greater degree than HFCs like R134a do. TFA, a highly durable substance, is brought down to earth in rain water and accumulates in aquatic ecosystems like fresh water bodies. While current concentrations of TFA are not considered harmful, “the verdict on the long-term potential harm to humans and the environment from TFA accumulation is still out,” said NGO Greenpeace in a position paper on HFOs released in July. ■ MH

CARB WEIGHS IMPACT OF KIGALI

The California Air Resources Board (CARB) is working with the Environmental Protection Agency and other stakeholders to evaluate the Kigali Amendment to the Montreal Protocol, which establishes a phase-down schedule for HFCs.

CARB is seeking to take a leadership position in the U.S. by working toward a 40% reduction in greenhouse-gas emissions by 2030, compared with 1990 levels. It is eyeing a combination of incentives and regulations to discourage the use of refrigerants that have a high global warming potential (GWP).

In April CARB published a Short-Lived Climate Pollutant (SLCP) Plan addressing the reduction of HFCs and other so-called short-lived pollutants with high GWPs, including black carbon (soot) and methane.

But as a consequence of the Kigali agreement, “a revised SLCP Plan from CARB is expected in the coming months,” said Stanley Young, director of communications at the board.

“It will reflect California’s proposed actions to further reduce HFC emissions, pending evaluation of projected HFC emissions and reductions from the global phase-down amendment.”

In the plan it published in April, CARB indicated that it would continue to seek opportunities to reduce HFC consumption ahead of international schedules.

“Even with a strong international agreement to phase down the use of HFCs, additional opportunities remain to reduce their emissions in California in the near-term and through 2030 at low cost,” CARB stated in the plan. “Early action, ahead of some of the phase-down schedules being proposed internationally, can avoid locking in the use of high-GWP refrigerants in new or retrofitted systems in the coming years.”

THE POWER OF BRAINS

A machine is only as good as the engineer who built it



CD300 SERIES - CD1900H MODEL

Compressor CD1900H from the CD300 series, is ideal for the optimisation of space thanks to its extremely contained size and weight.

Specifically suggested for refrigerated transport and heat pump applications, it is the largest 2-piston model of the CD range characterised by a displacement of 11.62 m³/h and P_{ss} of 100bar.



OFFICINE MARIO DORIN SINCE 1920

DORIN[®]
INNOVATION

For Henningsen, LESS IS MORE

The cold storage operator has cut thousands of lbs. of ammonia from its refrigerated systems in two plants by questioning the need for so much of it

– By Michael Garry



Pete Lepschat, Henningsen Cold Storage

Some people have a knack for challenging the status quo. Pete Lepschat, engineering services manager for Henningsen Cold Storage, is one such person.

The conventional wisdom in the cold storage industry has long been to use copious amounts of ammonia and not worry about it. Nowadays, there is a shift in thinking that is leading to lower ammonia charges in rooftop packaged refrigeration units as well as conventional engine room set-ups. At Henningsen, based in Hillsboro, Ore., outside of Portland, Lepschat began questioning the need for large ammonia charges more than seven years ago.

"I would be asked, 'ammonia is cheap, so why use less?' said Lepschat. His answer: "Because it's the right thing to do – to protect your employees and your surroundings. Ammonia is a great refrigerant, it's natural, but it's toxic. And as a fringe benefit, when you're under 10,000 pounds, you are a little less subject to scrutiny from the regulatory agencies."

That philosophy led Henningsen to install unorthodox ammonia refrigeration systems designed by Lepschat in two plants, with a third on the way. The systems, using a stick-built, engine-room design, dramatically reduce ammonia charge as well as energy consumption compared to conventional designs.

Henningsen, a fifth-generation family-owned business founded in 1923, operates 10 cold storage facilities, including six clustered in the Pacific Northwest, and four scattered across the U.S. in Idaho, North Dakota, Pennsylvania and Oklahoma. They focus on the agricultural industry, storing everything from strawberries, cranberries and apples to sweet corn, green beans and potatoes.

The six Pacific Northwest facilities include two in Washington state, three in the Portland, Ore., area and one in Salem, Ore., with a second Salem location opening next year. Other than leasing its Kent, Wash., location, Henningsen owns all of its properties.

For the past two decades, Henningsen has made a commitment to energy conservation, employing green building elements, LED lighting and computer-controlled refrigeration technology. The company's average energy consumption is 0.6 kW/cu.ft. compared to an industry average of 1.6, said Lepschat, who has been with the company for 22 years. The company's two warehouses in the Portland suburb of Gresham both have solar power installations, one 200,000 W, the other 80,000 W.

KEEPING AMMONIA FLOWING

Having cut its energy consumption, Henningsen turned its attention to reducing ammonia charge, but "without affecting energy conservation," Lepschat said. It made its first attempt at the second Gresham facility when it was built in 2009.

“We took the system apart, eliminated a few pieces of equipment and got the charge down.”

“The old way of designing a system was to say, if one pound of ammonia is good, five pounds is better,” said Lepschat. “But those other four pounds don’t really get you anything.”

His basic approach was to “look at every component [in the traditional refrigeration system] and ask if we need that much ammonia,” he said. “We took the system apart, eliminated a few pieces of equipment and got the charge down.”

Traditionally, liquid ammonia from the condenser goes to a high-pressure receiver (HPR) tank, where it remains until called upon. But Lepschat asked, why store the ammonia? Why not keep it busy? “So we eliminated the tank and put in a small vessel [2-ft. in diameter, 4-ft. tall] that maintains a low level of ammonia.”

The small vessel, essentially a way station, is fitted with a level probe and modulating Hansen valve; when the liquid level rises, the valve opens, feeding the ammonia directly to a low-pressure receiver (LPR) via a subcooler. Managed by a Logix control system, the overall design is called a “pump-down system.”

“So instead of storing a charge in the high-pressure vessel where it does nothing, we send it down to the low side right away. We put a little extra surge volume in our low-pressure vessel in a constant flow.” By taking out the HPR, Henningsen reduced the ammonia charge by several thousand pounds.

The constant-flow scenario also saves compressor energy, explained Lepschat. “With a constant flow, you can easily match the compressors exactly to the flow of refrigerant, rather than having surges and ebbs. That dovetails really well with a variable-speed compressor.”

LOWERING THE FEED

Another way to reduce charge is to lower the overfeed ratio of ammonia in the evaporators, which in a typical Henningsen facility is 3-1 (for every three parts of liquid ammonia, one part changes to gas).

In the Gresham facility, Henningsen purchased evaporator coils from Frick that enabled a 2-1 overfeed ratio. The lower overfeed ratio reduced the size of components like the LPR, the liquid piping and the coil tubes, decreasing the ammonia charge several thousand pounds more.

The combination of the lower overfeed ratio and the pump-down system cut the charge to about 5,000 lbs. from what would have been more than 10,000 lbs. “in most conventional design scenarios,” said Lepschat. The refrigeration capacity for that charge was 430 TR.

In 2014, Henningsen added about 50,000 sq. ft. of freezer space as well as additional refrigeration equipment to the Gresham facility, increasing the total ammonia charge to 7,500 lbs. and the capacity to about 630 TR.

ENERGY CONSUMPTION (KW/CU. FT.)

Industry Average (IARW): 1.6

Henningsen Average: 0.6

Second Gresham Facility: 0.3

COOLING FRIES WITH CO₂

CO₂ as a refrigerant in refrigerated transport is beginning to gain traction in Europe.

For example, the Delhaize Group uses the CryoTech liquid CO₂ system from Thermo King in 25 trailers in Belgium. The system allows liquid CO₂ to evaporate in coils in the cargo space, producing cooling, and then discharges the CO₂ gas into the atmosphere. (See “NatRefs Hit the Road,” Accelerate America, October 2016)

Makers of CO₂ refrigerated transport systems have their eyes on the U.S., but the market has yet to develop. However, up until a decade ago, railcars using CO₂ cryogenic refrigeration carried frozen french fries to a Henningsen Cold Storage facility in Idaho, noted Pete Lepschat, Henningsen’s engineering services manager.

“The railroad cars had trays filled with frozen fries and they shot liquid CO₂ into pans underneath to maintain the temperature,” he said. “We had CO₂ tanks at our facility for refills.” But the CO₂ system was replaced by mechanical HFC refrigeration about a decade ago.

“CO₂ was common for potato shipments for many years,” he said.



Engine room of Henningsen's first Salem, Ore., facility.

▶ In terms of equipment cost, though the Gresham refrigeration system did eliminate or downsize some parts in reducing the ammonia charge, its overall cost was about 12% to 15% more than a conventional system. The increase in costs came from investing in energy-efficient equipment like larger evaporator coils. "We do a lot of things that conserve energy but cost more money because they pay dividends over the lifetime of the system," said Lepschat.

In fact, the changes made at Gresham made it more efficient than the average Henningsen warehouse. Over the past year, the facility's energy consumption has been 0.3 kW/cu.ft., or half of Henningsen's average, saving 1.7 million kWh per year and \$115,000 in annual energy costs.

Moreover, the system's incremental equipment costs (compared to a standard system) were lessened by about 50% as a result of a roughly \$300,000 energy-efficiency incentive provided by the Energy Trust of Oregon. With the incentive and annual energy savings, Henningsen realized a 2.6-year payback on the incremental cost of the refrigeration system.

While the technicians maintaining the Gresham facility's system required training on how the system works – its motorized valves and computer software, for example – it was "nothing earth-shattering," Lepschat noted. "The system at its essence is conventional, with pumped overfeed and economized screw compressors."

SYSTEM SPECS

The low-charge ammonia systems at Henningsen Cold Storage's plants in the Portland, Ore., suburb of Gresham and in Salem, Ore., have the following characteristics:

Gresham

- Size of facility: 210,000 sq. ft.
- Temperature range: 75% freezers (-5°F); 25% coolers (36°F-38°F); dock (38°F -40°F)
- Frick evaporator coils, 2-1 overfeed ratio
- Ammonia charge: 7,500 lbs.
- System capacity: 630 TR
- Pump-down system
- Defrost: Hot gas
- Water-cooled condenser

Salem

- Size of facility: 220,000 sq. ft.
- Temperature range: 100% freezers (-8°F); dock (36°F)
- Evapco evaporator coils, 1.2-1 overfeed ratio
- Ammonia charge: 4,500 lbs.
- System capacity: 465 TR
- Pump-down system
- Thermosyphon glycol-based oil cooling
- Defrost: Hot gas
- Water-cooled condenser

Nature Outside



Nature Inside



NewTon

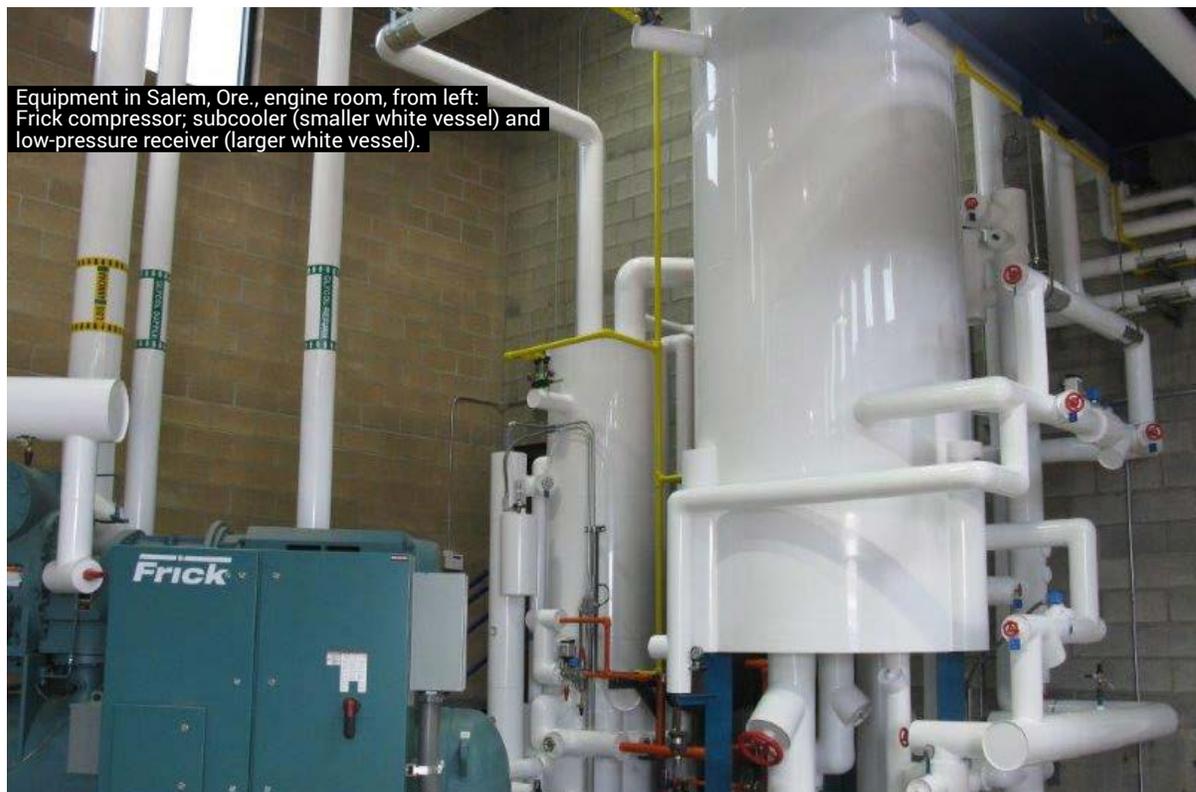
Progressive designs. Responsible solutions. Natural refrigerants.

CO₂ is a future-proof answer to refrigerant. Today's refrigeration systems use ammonia and CO₂, two natural refrigerants, to achieve a higher level of efficiency and energy savings. Best of all, it begins paying back both the owner and the environment the day the system starts. Monitored by a remote system with predictive maintenance diagnostics, it provides peace of mind and critical safety data for those who manage it. Learn more about environmentally-friendly and high efficiency refrigerants and systems at www.cimcorefrigeration.com. Let's get started. The future is here.

TOROMONT

CIMCO

CIMCO Refrigeration, Inc
800-456-2653
www.cimcorefrigeration.com



Equipment in Salem, Ore., engine room, from left: Frick compressor; subcooler (smaller white vessel) and low-pressure receiver (larger white vessel).

▶ NEXT OPPORTUNITY

Having successfully lowered the ammonia charge and energy consumption in its Gresham plant with a system that has “been stable and run well,” said Lepschat, he turned its attention to Henningsen’s first Salem plant, built in 2013-2014. “That was my next chance with low-charge.”

At the Salem plant, Henningsen installed the same pump-down system used at the Gresham warehouse, but changed to Evapco evaporator coils with a 1.2-1 overfeed ratio. “That’s a really low rate; you have mostly gas coming back from the evaporators,” said Lepschat. “It’s the optimum ‘happy spot’ for an overfeed rate in terms of minimizing your charge and still having really good ammonia surface wetting on the coils and good heat transfer.” Moreover, the Evapco coils allowed Henningsen to use smaller liquid pipes and pumps.

Lepschat considered using a DX ammonia evaporator rather than a “minimalist” overfeed model, but decided he would save more energy with the latter. He has also delayed trying low-charge packaged units until there is more experience with them in the industry.

Though the Salem plant is, at 220,000 sq. ft., larger than the Portland facility (210,000 sq. ft.), it has an effective ammonia charge of 4,500 lbs. vs 7,500 lbs. at Portland, with a capacity of 465 TR vs. 630 TR. The Salem plant’s energy efficiency is at least as good as Portland’s, even though Salem is larger, uses only freezers at -8°F, and has more turns and heat load entering it. The cost of Salem’s equipment was comparable to that of Portland.

The Salem warehouse also reduces ammonia charge by employing glycol rather than ammonia in a thermosiphon oil cooling process. A conventional system uses 2,000 to 6,000 pounds of ammonia

just to cool the oil in the screw compressors. “That seems silly,” Lepschat said. Instead, in the Salem system glycol captures 360,000 BTU/hour of oil heat and channels it to the flooring underneath the freezers to keep them from freezing. This also saves energy in the condenser, which would ordinarily have to reject the oil heat.

In its second Salem cold storage facility, expected to open in 2017, Henningsen plans to leverage oil heat to reheat the air and thereby control the humidity in its docks. “We’ll bring moisture out of the docks before it gets to the freezer, which will reduce defrosting,” said Lepschat.

Under consideration at the new Salem plant is a heat pump system for offices that leverages waste oil heat in the winter, and 60°F glycol from under-freezer floors for air conditioning in the summer.

The new Salem plant, with -5°F freezers, will be similar to the original, though smaller (163,000 sq. ft.) with 3,000 lbs. or less of ammonia charge and about 250 TR of capacity. It will eventually add another 250 TR but maintain roughly the same charge.

With such an unusual ammonia system at its Gresham and Salem plants, Henningsen required a contractor with the flexibility to try new things, and found one in PermaCold Engineering, based in Portland ([see page 60](#)). PermaCold has been “willing to take baby steps and work with us,” said Lepschat. “They get as excited about it as we do.”

Lepschat has every intention of continuing with low-charge ammonia systems and pushing the boundaries of what’s possible. “It’s early on but we’re not going to go back.” ■ MG



CO₂ at your fingertips

Why wait till tomorrow?

up to

25%
energy savings

CAREL offers complete solutions for optimum management of all refrigerant applications that use CO₂ as the refrigerant.

These are technologically advanced solutions that can manage all the complexities of these systems in terms of high pressure, climatic conditions and cooling capacity.

Experience, know-how and innovation are the key values underlying all of CAREL's solutions. CAREL control technology is aimed at ensuring reliability and efficiency in these types of systems, with special attention to warmer climates. Using CAREL electronics, significant improvements can be achieved in terms of energy efficiency, even up to 25% when compared to a system operating on synthetic refrigerant.



Going Natural with Vending Machines

Coca-Cola Japan expects to convert all of its beverage vending units to CO₂ or hydrocarbons by 2020

– By Andrew Williams & Jan Dusek



Stan Mah, Coca-Cola Tokyo Research & Development

Japan is a good place to be thirsty or hungry on the go, offering more vending machines per capita than any other country – one for every 23 people, according to the Japan Vending Machines Manufacturers Association.

And thanks in large part to Atlanta-based Coca-Cola Company, more than half of the beverage vending machines in Japan use natural refrigerants, either CO₂ or hydrocarbons, both of which are more energy efficient and environmentally friendly than the HFCs typically used in the machines.

According to *shecco's Guide to Natural Refrigerants in Japan 2016*, Japan has about 2.5 million beverage vending machines, of which 850,000 use CO₂ and 500,000 employ the hydrocarbon isobutene (R600a) as refrigerants, for a total of 1.35 million (54%). Vending machines represent a large future growth area for natural refrigerants in Japan.

Of the 1.35 million natural refrigerant vending machines in Japan, Coca-Cola units represent more than 500,000. Coke favors CO₂, with *shecco* estimating that 80% of its machines use that refrigerant, while 20% utilize hydrocarbons. In total, Coca-Cola bottling companies operate 980,000 vending machines in Japan.

By 2020, Coke is aiming to use either CO₂ or hydrocarbons in all vending equipment in the Japanese market, said Stan Mah, representative director and president of Coca-Cola Tokyo Research & Development, a subsidiary of the Coca-Cola Company.

"Our plan is to move out of HFCs," said Mah, in an interview with *Accelerate Japan*, at his company's renovated R&D facility in Odaiba, Tokyo. (*Accelerate Japan* is a sister publication of *Accelerate America*.) Estimating that the lifecycle of vending machines is eight years, "we should be able to replace our entire fleet by 2020," he said.

Globally, Coca-Cola deployed more than 1.8 million HFC-free units by the end of 2015. The company is striving to be 100% HFC-free in all new equipment purchases worldwide – primarily bottle coolers and vending machines – within two years (except for certain specialty equipment).

Take
regulatory
compliance
out of the equation.



CO₂-based commercial refrigeration is emerging as a preferred global technology. But realizing its potential means solving the entire equation. With scroll and semi-hermetic CO₂ technology, onboard diagnostics and complete CO₂ system communications—all from Emerson—the full promise of CO₂-based refrigeration is achievable. We'll help you exceed your energy and environmental targets, and ensure regulatory compliance for the foreseeable future. [EmersonClimate.com/CO2](https://www.emersonclimate.com/CO2)



EMERSON. CONSIDER IT SOLVED.™

► HIGHER COSTS

Coca-Cola Japan started using natural refrigerants in 2005. Since 2011, all new Coca-Cola can and plastic bottle vending machines in Japan have been using natural refrigerants.

Mah remains committed to adopting natural refrigerants despite the extra cost of CO₂ or hydrocarbon vending machines compared to conventional HFC technology.

On a global basis, Coca-Cola had decided to focus mostly on CO₂ as the refrigerant for new beverage coolers, vending machines and fountain equipment. However, last June at the ATMOSphere America conference in Chicago, Antoine Azar, the company's global program director, announced that Coke "will open the door" to hydrocarbon refrigerants for smaller cooler equipment. ([See Short Takes, Accelerate America, July-August 2016](#))

Azar defined smaller equipment as units with a volume at or below 300 l, which accounts for 10% of its equipment. "Everything above 300 liters must still be CO₂. Below 300 you can go with either CO₂ or hydrocarbons [either propane or isobutane]," he said. The reason for the move was the difficulty of using CO₂ compressors in small equipment.

Coca-Cola Japan's position is that "we're open to hydrocarbons in vending machines, but we prefer CO₂," said Mah.

The average energy consumption of Coca-Cola Japan's latest vending machines is just one sixth of what it was 15 years ago. In the wake of the nuclear disaster at Fukushima in 2011, companies were encouraged to reduce their electricity consumption to help put an end to the blackouts that were plaguing the country.

Coca-Cola Japan responded in 2013 by launching the "Peak Shift" vending machine, which contains a CO₂ compressor. Designed to reduce daytime electricity consumption, the Peak Shift has become the firm's flagship vending machine. The company presently has about 145,000 of these machines in the field.

"It works really well in daytime," said Mah. "But we always look for ways to make it even more efficient."

In 2015 Coca-Cola Japan announced plans to add ejector technology to the mix to improve efficiency. Field tests in different parts of Japan are continuing, and Mah sees CO₂ vending machines with ejectors reducing power consumption compared to conventional HFC models.

“Our plan is to move out of HFCs.”

– Stan Mah, Coca-Cola Tokyo Research & Development

But until costs come down, Mah is not ready to commit to scaling up adoption of CO₂ vending machines with ejectors. "We're still evaluating. They save energy, but they cost a lot. We want to balance cost and energy savings."

Another new product is an ice-cold vending machine, which Coca-Cola Japan recently rolled out across about 1,000 7-Eleven stores. The machine slow-cools the cola so that it's not frozen. "But the moment it comes out, it freezes," Mah said. "It comes out like a Slurpee."

Lack of training among maintenance technicians and installers is often cited by potential users of natural refrigerants as a barrier to their wider uptake. Mah, however, said Coca-Cola Japan has yet to experience such frustrations.

"A lot of the maintenance is done by our supplier. They are really good, so there are no problems. We don't see any issues, whether CO₂ or hydrocarbons." ■ AW & JD



Peak Shift vending machine

WITH MORE THAN 60 YEARS OF EXPERIENCE IN COMPRESSOR TECHNOLOGY AND HIGHLY COMMITTED EMPLOYEES, OUR FOCUS IS TO DEVELOP AND APPLY THE

ADVANCED COMPRESSOR TECHNOLOGIES TO ACHIEVE STANDARD SETTING PERFORMANCE FOR LEADING PRODUCTS AND BUSINESSES AROUND THE WORLD.



NO MORE ENERGY WASTE WITH VARIABLE SPEED COMPRESSORS

SECCP



up to **40%**

ENERGY REDUCTION
POSSIBLE WITH VARIABLE SPEED CONTROL IN SUPERMARKET AND CONVENIENCE STORE CABINETS, COMPARED TO NON-OPTIMISED COMPRESSORS.

IP54

- WITH 105N4710 SERIES CONTROLLER
HIGH PROTECTION CLASS
AGAINST DUST AND WATER JETS



The new Secop variable speed **NLV12.6CN propane (R290)** compressor solution provides in a single unit perfect cooling efficiency, tailormade features, easy integration while ensuring considerable energy savings.

The new **°CCD®** controllers deliver a high starting torque and can start against a differential pressure.

- Energy savings of up to 40%
- IP54 controller housing
- Suitable for LBP and MBP applications
- High starting torque
- Easy customization via **T00L4COOL®** software



HEADQUARTER GERMANY & GLOBAL SALES | Secop GmbH | Mads-Clausen-Str. 7 | 24939 Flensburg | www.secop.com
SALES OFFICE CHINA | Secop Compressors Co., Ltd. | 1603C, Oriental Century Plaza Business Center No. 345 | Xianxia Rd. | Changning District Shanghai 200050
SALES OFFICE CHINA | Secop Compressors Co., Ltd. | 1309, Olympic Park Building | Luoxi New City | Panyu District | Guangzhou 511431
SALES OFFICE USA/AMERICAS | Secop Inc. | Roswell, Georgia | 4000 Northfield Way | Suite 600 | Roswell, GA 30076
SALES OFFICE EUROPE | Secop Italia Srl | Piazza Vittorio Emanuele II, n°3 | 10024 Moncalieri (Turin)
SALES OFFICE RUSSIA | Secop GmbH | 1. Kasatschij per. 7 | 119017 Moscow

SETTING THE STANDARD

25 Movers & Shakers

Welcome to *Accelerate America's* first list of 25 people who have played a critical role in advancing the adoption of natural refrigerant-based systems in North America

– By Michael Garry

The great inventor Thomas Edison once said, “Genius is 1% inspiration and 99% perspiration.”

The 25 Movers & Shakers included in the following list are people – mostly end users and manufacturers – who have been inspired by the potential of natural refrigerants to do the hard work of transforming a brilliant idea into a commercial reality, usually by disrupting the status quo.

In this initial list we are covering not only 2016 but the years leading up to it as well.

This list was both easy and hard to assemble. There are some people whose contributions are so compelling that their names automatically populate the list. Others are not as obvious, but on reflection have made, or started to make, a real difference. But the biggest difficulty is deciding whom to leave out. We have limited ourselves to 25 slots, though many more people could certainly be considered “Movers & Shakers.” We regret that they were not able to be included this time.

In making our selections, we followed a few guidelines:

- ▶ The people on the list have to be recognizable in the industry by appearing at industry events, conferences and trade shows, and participating on committees.
- ▶ They have to be focused on natural refrigerants, as opposed to other refrigerant options.
- ▶ We could only select one person per company, so unfortunately we've left out others at the same company who have also played a critical role. But if a company is represented on the list, it should be understood that it usually takes more than one person to make progress.
- ▶ We have organized the list by OEMs, component manufacturers, end users (food retailers, industrial and foodservice) and in one instance, utilities, which are becoming increasingly important to natural refrigerant adoption. We have decided not to include association executives, academics, government officials or consultants.
- ▶ Finally, we are not ranking the 25 people on the list. They are all considered of equal status, each in his own unique fashion.

ORIGINAL EQUIPMENT MANUFACTURERS

JEFFREY GINGRAS



President, Systèmes LMP

Key Accomplishment: Leading Systèmes LMP's marketing of efficient transcritical CO₂ systems, often as a replacement for aging equipment in existing stores.

Jeffrey Gingras, who was promoted from vice president to president of Systèmes LMP in November 2015, has been

active in promoting its transcritical CO₂ systems in Canada and the U.S. Gingras played a role in Systèmes LMP's decision to build its own testing facility to develop solutions for low-temperature applications, including cascade, subcritical and transcritical CO₂. Systèmes LMP has distinguished itself in the marketplace with a transcritical system that uses mechanical subcooling to operate more efficiently in warmer climates. The company has also gained attention for replacing aging R22 systems at Sobeys stores in Canada with transcritical CO₂ systems, including one store that has an integrated refrigeration/air conditioning and heating system; it replaced an R22 system at a Montreal-area warehouse operated by Plaisirs Gastronomiques with an innovative hybrid solution combining an ice slurry, a CO₂ cascade system and two transcritical CO₂ systems.

SCOTT MARTIN



Director of Sustainable Technologies, Refrigeration Systems Division, Hillphoenix

Key Accomplishment: Spearheading Hillphoenix's Second Nature division and supporting the acquisition of Advansor.

A third-generation refrigeration engineer, Scott Martin has been instrumental in leading Hillphoenix's Second Nature line of refrigeration equipment, which was introduced in the mid-1990s as one of the first cooling technologies to reduce the charge of refrigerants that deplete the ozone layer or have a high GWP (global warming potential). Martin is a constant presence at industry events and frequently quoted in trade publications discussing the latest installation of Second Nature CO₂ equipment, including secondary, cascade, and, more recently, transcritical units, which have now exceeded 200 units in North America ([see page 56](#)). He was a key player in Hillphoenix's 2011 acquisition of Danish transcritical OEM Advansor, which helped Hillphoenix to become a transcritical OEM ([see page 58](#)).

MARC-ANDRÉ LESMERISES



CEO and Co-Founder, Carnot Refrigeration

Key Accomplishment: Producing the first transcritical systems in North America and the first propane/CO₂ system in the U.S.

Marc-André Lesmerises, *Accelerate America's* Person of the Year in 2016, helped bring CO₂ transcritical refrigeration to the North American continent

in 2009 as a supplier of Sobeys' first units, and to the U.S. in 2013, as a supplier to Hannaford Supermarkets. Since then, he has expanded his repertoire, making CO₂ systems for cold storage and processing plants, ice rinks and data centers, and also ammonia/CO₂ and ammonia/glycol systems for industrial facilities. In one of his boldest moves yet, this year he created the first U.S. propane/CO₂ cascade system for a Whole Foods store in Santa Clara, Calif., with 285 lbs. of propane in seven modules on the roof.

HOWELL FEIG



Sales Director for Strategic Accounts, AHT Cooling Systems USA

Key Accomplishment: More than 600 U.S. stores with propane cases

Howell Feig, who has been with AHT since the company entered the North American market in 2005, has overseen the exceptional growth in the

adoption of AHT's propane plug-in display cases in the U.S. Through mid-September, AHT had installed the units in more than 600 stores in 2016 alone. All told, more than 1,000 U.S. stores have AHT's propane cases – mostly modular islands but also spot merchandisers – usually as a supplement to remotely cooled cases. At least a half-dozen food retailers are considering installing self-contained propane units throughout an entire store.

▶ STEVE TRULASKE



Owner, True Manufacturing

Key Accomplishment: Promoting propane refrigeration, getting EPA SNAP approval for propane in commercial refrigeration.

True Manufacturing, winner of *Accelerate America's* Innovation of the Year award in 2016, was the first major OEM to convert

many of its stand-alone merchandising and refrigeration equipment to small-charge propane refrigerant. Owner Steve Trulaske was the driving force for True in promoting its transition to propane refrigeration. He authorized True to submit one of the two U.S. EPA SNAP submissions that led to the approval of propane in commercial refrigeration in the U.S., as well as SNAP applications that resulted in approval for the venting of hydrocarbons. True is also represented on the Department of Energy ASRAC (Appliance Standards and Rule-making Federal Advisory Committee) as well as on the IEC 61C committee working on increasing allowable charge sizes of flammable refrigerants.

JOHN SCHERER



Chief Technology Officer, NXTCOLD

Key Accomplishment: Developed the NXTCOLD low-charge ammonia packaged system.

Worried about the possibility of a catastrophic ammonia leak at Los Angeles Cold Storage, where he is a longtime manager of engineering, John Scherer worked nights and weekends for

four years to develop the NXTCOLD low-charge packaged ammonia refrigeration system. Scherer has overseen installation of NXTCOLD units at LA Cold Storage, at Lineage Logistics' Oxnard, Calif., facility, and at a Baker Cold Storage facility in Long Beach, Calif. (under the supervision of Lineage), with 46 rooftop units. The NXTCOLD units carry an ammonia charge of 50 lbs. or less, or less than 1 lb. per TR, with a typical efficiency gain over traditional systems of 8%. Scherer is current chairman of the Global Cold Chain Alliance (GCCA) Refrigeration and Energy Committee.

KURT LIEBENDORFER



Vice President, Evapco

Key Accomplishment: Heading the rollout of low-charge-ammonia Evapcold units.

Kurt Liebendorfer is leading the development and market introduction of the new Evapcold products, which are low-charge ammonia packaged refrigeration systems. The first Evapcold units were installed

this year on the rooftop of Western Gateway Storage in Ogden, Utah. Evapcold units hold a charge of 2.5-5 lbs. of ammonia per TR. In helping the industrial refrigeration industry transition to low-charge systems, Liebendorfer has spoken publicly about the need for industry codes and standards to have a consistent definition of low-charge. He has also argued for codes and regulations to better reflect the lower risk posed by low-charge systems, which would reduce their cost. The recent revision of the IAR-2 safety standard does offer low-charge ammonia systems a little more leniency.

MASOOD ALI



Global Leader of Center of Excellence for Alternative Systems, Heatcraft Worldwide Refrigeration

Key Accomplishment: Designed a low-charge/high efficiency NH₃/CO₂ cascade system installed at a Piggly Wiggly store.

Masood Ali has designed and validated systems such as a transcritical condensing unit with split cycle and two-stage compression, a transcritical booster system with two-stage expansion for supermarkets, and a low-charge, high-efficiency NH₃/CO₂ cascade system for supermarkets and cold storage. The NH₃/CO₂ system is installed in a Piggly Wiggly store nearby Heatcraft's facility in Columbus, Ga.; the ammonia rack in the store was found to consume 22% less energy than an HFC rack Heatcraft installed there for comparison purposes. Ali is a member of ASHRAE, a corresponding member of ASHRAE 10.7, a member of the CANENA Technical Harmonization Sub-Committee, and a member of UL's Joint Task Force for Flammable Refrigerants.

COMPONENT MANUFACTURERS

BRUCE NELSON



President, Colmac Coil Manufacturing

Key Accomplishment: Developed low-charge-ammonia DX evaporators for low-temperature industrial applications.

In 2014, Bruce Nelson's company, Colmac Coil, tested and patented evaporator technology that for the first time supported low-charge

industrial ammonia refrigeration using direct expansion (DX) at low temperatures in concert with a central machine room. DX ammonia had previously been limited to medium- and high-temperature systems. Colmac's DX evaporator coil uses enhanced aluminum technology that reduces the ammonia charge to around 5 lbs./TR. Since then the technology has been implemented by Preferred Freezer Services, Shepherd's Processed Eggs, Joliet Cold Storage and US Cold Storage, among others. Nelson is an active member of ASHRAE at both the local and national levels, and also serves as a director of IIAR (International Institute of Ammonia Refrigeration)

MAREK ZGLICZYNSKI



Manager of Commercial Refrigeration Product Engineering, Embraco

Key Accomplishment: Helping Embraco make hydrocarbon compressors a success worldwide

Global compressor maker Embraco has been a leading manufacturer of hydrocarbon compressors in Europe, with

more than one million installed light commercial units and tens of millions of installed household units. Asia is its second largest market and North America its third. But at ATMOSphere America in June, Marek Zgliczynski said the efficiency of hydrocarbons, which exceeds that of old and new refrigerants, will trigger a wider rollout in the U.S. To that end, Embraco introduced three new hydrocarbon products this year for the North American market. Zgliczynski has helped to make hydrocarbon compressors a success for Embraco worldwide. His responsibilities include the development of household and light commercial refrigeration products and related processes, and providing technical assistance to sales to promote the advantages of Embraco products, as well as cooperating with customers in energy-efficient and reliable refrigeration design. Zgliczynski was recently elected chairman of the IEC/SC61C subcommittee, an international group working on safety standardization for the refrigeration industry, including raising the charge limit for hydrocarbons. ▶

JOE SANCHEZ



Application Engineering Manager, Bitzer US

Key Accomplishment: Promoting the exchange of natural refrigerant technologies across the commercial and industrial sectors.

Joe Sanchez has gained some distinction in the natural refrigerants industry for coining the word "industrommercial,"

which means "suitable or fit for industrial or commercial use." The term reflects the growing overlap of commercial and industrial applications of natural refrigerant technologies. In his many industry presentations, Sanchez shows how each sector can make use of the other's technology, with Bitzer providing compressors that serve both. The exchange of technologies, he believes, will ensure the success of natural refrigerants. Sanchez is a member of IIAR, RETA and ASHRAE, and is also active with AHRI in the Compressors and Condensing Units section and its subcommittees.

▶ JAMES KNUDSEN



North American Segment Leader for Food Retail, Danfoss

Key Accomplishment: Sharing insights about the business case for transcritical CO₂.

James Knudsen joined Danfoss in September 2015 after a long career in the refrigeration business and other segments.

From 2011 to 2015, he focused on the global product development strategy for advanced refrigeration systems. To this he brought a passion for, and understanding of, natural refrigerant technologies, which he communicated in a trio of guest columns he wrote for *Accelerate America*. In his first column he outlined the basic choice faced by the HVAC&R industry: to proceed with chemical refrigerants or invest in natural refrigerants, a long-term solution that is known, viable and safe. His other two columns broke down the business case for transcritical CO₂ systems, first looking at their overall ROI and then analyzing their energy advantages – even in warm climates, if the proper technology enhancements are used.

▶ ANDRÉ PATENAUDE



Director - CO₂ Business Development, Emerson Climate Technologies

Key Accomplishment: Educating the industry on the nuances of CO₂ technology.

André Patenaude is Emerson's CO₂ maven, responsible for developing its global strategy for marketing CO₂-related products such as compressors

and controllers. His work brings him in contact with end users, contractors, wholesalers and OEMs. He can often be found explaining the magic of CO₂ as a refrigerant – along with its inherent challenges – at industry conferences and trade shows. He put his CO₂ expertise to good use in a guest column in this magazine in the November 2015 issue called “Seven Keys to Servicing CO₂ Systems”.

END USERS: FOOD RETAIL

▶ PAUL ANDERSON



Director of Engineering, Target

Key Accomplishment: CO₂ cascade prototype system, plans for self-contained propane cases

Paul Anderson stirred the audience at the ATMOsphere America 2014 conference when he announced that Target had adopted a new prototype

refrigeration system for its PFresh outlets – a hybrid cascade that uses DX CO₂ for low-temperature cases. At the Food Marketing Institute's Energy & Store Development Conference in 2015, he joined with consultant Keilly Witman in explaining the potential of self-contained propane cases, which Target found to consume 53% less energy than cases using R134a. He vowed at a White House-hosted meeting the next month that Target's new stand-alone cases would be HFC-free, and later sent out notifications to suppliers outlining Target's plans for propane cases. Since then, the chain has started using self-contained propane units in a number of stores. In 2017, Target plans to install its first transcritical CO₂ systems in a few locations.

▶ KEVIN CHRISTOPHERSON



Director of Purchasing & Maintenance, Roundy's

Key Accomplishment: Launched Roundy's first transcritical CO₂ system, which has led to six more this year.

Kevin Christopherson spent two years evaluating whether Roundy's should test a CO₂-only transcritical refrigeration system. He ultimately decided

the chain should move forward with a test, and secured buy-in from its chairman and chief executive officer, Robert Mariano. The first transcritical installation took place at a Pick 'n Save store in Menomonee Falls, Wis., in January 2014. On an annual basis, the transcritical system saves \$13,000 in energy costs over a comparable HFC system. The success of the first test led Roundy's, now a division of Kroger, to install a second transcritical system in January 2016, followed by five more installations this year; four more transcritical stores are slated for 2017, which will make Roundy's the leading user of transcritical technology in food stores in the U.S. other than Whole Foods Market. Christopherson, whose vision started it all, continues to manage the transcritical rollout.

TRISTAM COFFIN



Director of Sustainability & Facilities, Whole Foods Market's Northern California division

Key Accomplishment: Managing a potpourri of natural refrigerant systems.

Whole Foods Market has distinguished itself in the marketplace by its willingness

to test every available natural refrigerant option. The person who has played one of the largest roles in this process is Tristam Coffin, who operates out of Northern California but coordinates with Whole Foods' corporate executives on sustainability projects. While still working on the East Coast, he oversaw Whole Foods' first transcritical (and totally HFC-free) store in Brooklyn, N.Y. In California, he has managed cascade systems, a slew of transcritical stores, numerous installations of self-contained propane cases, an ammonia/CO₂ store system, and his latest project, a propane/CO₂ cascade system in a store in Santa Clara, Calif.

YVES HUGRON



Director of Buildings, Systems and the Environment, Sobeys Quebec

Key Accomplishment: Helping to make Sobeys the leader in transcritical CO₂ installations among North American food retailers.

Yves Hugron played a prominent role in starting Sobeys, winner of *Accelerate America's* 2016 Best in Sector/Food Retail Award, on the road to transcritical CO₂ systems in its corporate and franchised stores in Quebec in 2009, and establishing the technology as the chain's standard refrigeration system in 2011. Since then, Sobeys has become the leader in transcritical installations among North American food retailers, deploying them in 82 stores (mostly in Quebec but in other provinces too) as of last July, with another nine installations expected by year's end. Every year, 15-20 additional stores are equipped with transcritical CO₂, both new stores and retrofits. Hugron was and remains adamant about the need for transcritical, a future-proof, energy-efficient system that will safeguard the chain from future refrigerant phase outs.

HARRISON HORNING



Director of Energy & Facility Services, Hannaford Supermarkets

Key Accomplishment: Managed first installation of transcritical CO₂ refrigeration in a U.S. supermarket, and is pursuing a transcritical retrofit.

Harrison Horning made his initial mark in the natural refrigerants marketplace by

overseeing the first installation of a transcritical CO₂ system in a U.S. supermarket – in a Hannaford store in Turner, Maine, in July 2013. At ATMOsphere America 2015, he reported that the energy performance of the transcritical system was comparable to that of HFC DX system in a similar store. Since then, Hannaford opened a second transcritical store in North Berwick, Maine in 2015, and is beginning installation of a transcritical system in an existing store in Raymond, N.H., its first retrofit project. Horning has also started installing self-contained propane cases, and is among the first retailers to purchase carbon credits from retailers and others that have earned them by recycling HFC refrigerants.

KEITH MILLIGAN



CIO, JTM Corp. (Piggly Wiggly)

Key Accomplishment: Installing an NH₃/CO₂ cascade system in a store, and allowing energy comparisons to an HFC rack.

When JTM Corp. decided to open its 19th Piggly Wiggly store in Columbus, Ga., Keith Milligan decided it would use a refrigeration system tried in only

three other stores in the U.S. – an ammonia/CO₂ cascade system, the ammonia confined to the roof. The system was provided by Heatcraft Worldwide Refrigeration's Kysor/Warren brand, whose factory is just 1.5 miles from the new store. Milligan allowed the store to serve as a test lab for Kysor/Warren, which installed an HFC rack there just so that a direct energy comparison could be made between the ammonia rack and the HFC rack. Over a four-month period, the ammonia rack was found to consume 22% less energy on average than the HFC rack. The store has become a showcase for other retailers to learn about using ammonia in supermarket refrigeration.

END USERS: INDUSTRIAL

BING CHENG



Principal Utilities Engineer, Campbell Soup

Key Accomplishment:

Overseeing conversion of Pepperidge Farm bakeries to low-charge ammonia packages.

Campbell Soup, winner of *Accelerate America's* 2016 Best in Sector/Industrial Award, is a pioneer in the development of low-charge ammonia systems,

led by its longtime head of refrigeration engineering, Bob Czarnecki. Bing Cheng, who succeeded Czarnecki last year, is carrying on this tradition. Under Cheng's direction, Campbell continues to convert Pepperidge Farm bakeries from R22 and HFC to low-charge ammonia packages. Its latest conversion project in Lakeland, Fla., will employ Campbell's first NH_3/CO_2 system. Cheng serves on IAR's standards committee, focusing on CO_2 and insurance issues.

MICHAEL LYNCH



Vice President - Engineering, United States Cold Storage

Key Accomplishment: Managing rollout of NH_3/CO_2 systems.

Beginning in 2005, United States Cold Storage has led the cold storage industry in the installation of ammonia/ CO_2 cascade systems. With direction from Michael Lynch, the company now operates 12 plants

with the technology, out of its 36 total facilities. Lynch has overseen these deployments since becoming vice president – engineering in 2011. Up until the last few years, many in the industry doubted the efficacy of NH_3/CO_2 refrigeration, but Lynch maintained US Cold Storage's commitment to the system. Now it is becoming increasingly adopted as the advantages have become clear: no ammonia in the storage areas, much less ammonia charge, costs comparable to those of standard systems, and energy efficiency (5.8% more on average than conventional systems at US Cold Storage).

DAVID BORNEMEIER



President and CFO, Western Gateway Storage

Key Accomplishment: Being the first end user of the Evapcold low-charge ammonia system.

New technology requires an end user willing to be the first to implement it. In the case of Evapcold, Evapco's low-charge-ammonia packaged refrigeration system, that end user is Western

Gateway Storage, Ogden, Utah, which installed two of the units on the rooftop of its new cold storage facility this year. Becoming the first user of the Evapcold system was the decision of David Bornemeier, an entrepreneur who, with his wife, Becky, purchased Western Gateway in 2011. Bornemeier was initially advised to invest in a less expensive Freon-based refrigeration system; but applying due-diligence skills honed as a financial analyst – including a willingness to ask “dumb questions” – he rejected that advice and went about investigating his options. He ultimately chose Evapcold, and discussed his reasons at the ATMOSphere America conference in June, citing low charge, regulatory relief, first costs comparable to a conventional ammonia system, and the expectation of 20% energy efficiency gains.

END USERS: FOODSERVICE

ANTOINE AZAR



Global Program Director, The Coca-Cola Company

Key Accomplishment: Driving worldwide adoption of HFC-free equipment.

Coca-Cola has become the lead proponent of using CO₂ as a refrigerant in beverage coolers and vending machines worldwide in lieu of HFCs, with a much smaller percentage

employing propane. By the end of 2015, the company had deployed more than 1.8 million HFC-free units globally. The global manager of Coke's HFC-free program is Antoine Azar; he is also chairman of the HFC-free advocacy group Refrigerants, Naturally!. Azar is helping to drive Coke's plan to be HFC-free in almost all new equipment purchases within two years. North America is somewhat behind other regions, with 12,354 HFC-free units in 2014, but that year Coke reported that a substantial portion of North America's equipment purchases were CO₂-based. At ATMOSphere America in June, Azar said Coke is opening the door to more hydrocarbon equipment in smaller coolers.

RICHARD REEVES



Director of Fleet/ Purchasing/Safety & Compliance, Red Bull North America

Key Accomplishment: Helping bring ECO-Coolers to the North American market

Red Bull, winner of *Accelerate America's* 2016 Best in Sector/Foodservice Award,

has been a leader in North America in the implementation of hydrocarbon (in this case isobutane) coolers for its energy drinks. Richard Reeves, who joined Red Bull in 2010, has helped steer its North American division's efforts to roll out the energy-efficient ECO-Coolers, which included getting EPA approval for isobutane in stand-alone commercial cabinets in 2013. The division has also worked with Red Bull's Austria-based purchasing team to buy coolers accommodating U.S. power ratings. The upshot: Red Bull has deployed over 200,000 isobutane coolers in the U.S., a number Reeves expects to double within two years. The units use 45% less energy than standard coolers.

UTILITY

PAUL DELANEY



Senior Engineer, Southern California Edison

Key Accomplishment: Overseeing incentive programs for natural refrigerant equipment.

Utility energy incentives have become an important resource for end users seeking to reduce the first-cost of natural refrigerant systems, which

typically have an energy-efficiency story to tell. Led by Paul Delaney, Southern California Edison is a utility that has taken a particular interest in supporting natural refrigerants through incentive programs. He has overseen energy-assessment projects leading to custom incentives for self-contained supermarket freezers using propane and for low-charge ammonia packaged systems. Delaney continues to study the energy efficiency of propane and low-charge ammonia units. He is especially excited about the potential of low-charge ammonia for industrial and office-building air conditioning.



News From Across the Pond

Chillventa 2016, featuring the world's largest exhibition of natural refrigerant technologies, offered developments in CO₂, hydrocarbon and ammonia components and systems

– By Michael Garry

Europe, where natural refrigerant technologies are more prevalent than anywhere else in the world, is also home to the largest exhibition of natref products – Chillventa, held every two years in Nuremberg, Germany.

This year's event, which took place October 11-13, was no exception. Across eight exhibit halls, the abundance of CO₂, hydrocarbon and ammonia components and systems was notable, especially to a U.S. reporter attending the show for the first time.

The following is a review of some of the major natural refrigerant exhibitors at Chillventa, many of them European companies, some with products marketed in North America, and others that have not yet made it across the pond, but would like to.

CO₂

GREEN & COOL EYES U.S. MARKET

With its second U.S. installation this month at a Whole Foods Market store in Walnut Creek, Calif., Green & Cool, a Swedish maker of transcritical CO₂ refrigeration systems, is set to bring its technology to the U.S. market.

"It's a huge opportunity," said Paul Bevington, Green & Cool's sales manager, U.K., U.S., Canada and Australia. "We are thankful to Tristram Coffin [director of sustainability and facilities at Whole Foods' Northern California division] for getting a pilot out there."

Green & Cool's transcritical systems are widely used in Europe, where there are more than 5,000 installations by all suppliers. Its first U.S. transcritical deployment took place in 2013 at Walgreens' "net-zero-energy" store in Evanston, Ill. "Walgreens approached us about that one," said Bevington. "But we weren't ready at the time for a further U.S. rollout, and the market wasn't ready either."

However, with more than 300 transcritical installations in North America since 2013, he sees the market turning, "especially with the legislation in California, but also the rest of the country."

Green & Cool's strategy in the U.S. is to pursue slow organic growth. "We want to prove the technology so as the market grows we can grow with it and become an important part of it," said Bevington.

Among the features of Green & Cool's transcritical units is an internally designed controller dedicated to "the exact system it is built for," said Johan Hellman, sales engineer for Green & Cool. In addition, the systems are designed to never lose CO₂ in the event of a power failure, he said. At Chillventa, Green & Cool introduced its compact CO₂ transcritical condensing unit for small applications.



Sergio Girotto, Enex

ENEX HITS MILESTONES

Technology enhancements such as ejectors and parallel (auxiliary) compressors have been found to dramatically improve the efficiency of transcritical systems in warm climates, when temperatures exceed CO₂'s critical point, 88°F (31°C).

One of the pioneers of those enhancements, Italian OEM Enex, has produced over 150 transcritical systems with parallel compressors, and almost 50 with ejectors, as of September 2016.

Enex produced its first systems with parallel compressors in 2008, its first liquid ejectors in 2012, and its first gas ejectors in 2013, said Sergio Girotto, president of Enex. In systems with parallel compressors, liquid ejectors add 13%-15% more efficiency than a standard transcritical booster system, while the combination of liquid and gas ejectors makes the systems 25%-27% more efficient, he said.

Enex has sold its enhanced systems across Europe, including Italy, Poland, Romania, Switzerland and Germany. Any European country, apart from Scandinavia nations and Northern Germany, would benefit from ejectors and parallel compressors, Girotto said. "Those countries all have at least two to three days of warm temperatures from an operational point-of-view."

Enex is open to partnering with a U.S. company to bring its systems to the U.S., said Girotto.



Green & Cool booth at Chillventa.

HYDROCARBONS

▶ SECOP AIDS HYDROCARBON CONVERSIONS

Capitalizing on the growing interest in hydrocarbon refrigeration units in the Americas, German compressor maker Secop is helping OEMs to convert from HFCs to hydrocarbons at its U.S. testing facility near Atlanta.

"We're taking cabinets from [OEM] customers in North America and Latin America and doing optimization and conversion to R290 [propane] or R600a [isobutene]," said Sam Huffman, key account manager for Secop.

Huffman is based at Secop's U.S. headquarters in Roswell, Ga., which opened in 2013 and is "100% focused on hydrocarbons in our product development," he said.

The optimization/conversion process involves changing the condenser, fan or controller, Huffman explained. "This allows customers without internal testing capabilities but are still interested in pursuing natural refrigerants to convert their cabinets."

The applications undergoing conversion cover everything from glass-door merchandisers and food service equipment to freezers and water dispensers.

TRIPLEAQUA'S DUTCH DEBUT

The TripleAqua, an energy-efficient heat pump that made its debut in March 2015 at shecco's ATMOSphere Europe conference, has been installed at three commercial locations in the Netherlands, using hydrocarbon refrigerants and a heat-and-cold storage system to drive down energy consumption and carbon emissions.

"We started sales a year ago, mainly for bigger buildings, which take a year to get to know it," said Menno van der Hoff, manager of R&D HVAC for the Dutch supplier Uniechemie (Union Chemicals). "Now we have projects up-and-running, and the factory is full till the end of the year."

Uniechemie is a division of Swedish HVAC&R distributor Beijer Ref, which is marketing TripleAqua and displayed a unit at its Chillventa booth. Beijer Ref's initial sales focus has been in Europe.

Van der Hoff described three installations of TripleAqua, declining to name the end users. One is a premium office building with a ground source indoor unit for space heating and cooling. "Due to the ground source, it's extremely efficient," he said.

A second space heating/cooling installation is in an office attached to a cold storage facility running an ammonia refrigeration system. "They wanted climate control to be fully natural," he said.

At a third location, a store owned by a German supermarket chain, the Triple Aqua is combined with the refrigeration system, which also uses natural refrigerants. "The rejected heat [from the refrigeration system] is given to the TripleAqua for heating the building and cooling in the summer," said van der Hoff.

Next year, Beijer Ref will build a new factory, which will be used in part to construct TripleAqua units. "We are building units for bigger buildings for end users with a policy of using natural refrigerants, and for government buildings like town halls," he said.

According to Beijer Ref, TripleAqua can save up to 50% in heating and cooling costs in commercial buildings (including office buildings, hotels and hospitals) compared to traditional heat pumps, with a COP (coefficient of performance) between four and 10.

The system employs propaene (R443A), a mixture of the hydrocarbons propane (R290) and propene (R1270), with a global warming potential (GWP) of three and a charge of less than 11 lbs. (5 kg). "Propane is known for its efficiency and propene outperforms propane at negative temperatures," said van der Hoff. "And propene has a strong smell, which people like for safety."

TripleAqua has the ability to store heat and cold in buffers for later use in the building, providing heating and cooling simultaneously or individually. It uses three water-loop pipes to distribute heat (82°F-97°F), cold (54°F-64°F) and return water at ambient temperature. ▶



TripleAqua unit at Chillventa

Natural Refrigerants Compatible

Ammonia • CO₂ • Hydrocarbons

Temprite 130 Series Delivers:



- Proven Energy Savings
- Lower Emissions

Now 140 Bar!*

* Model 131 Rated 160 Bar
Model 139A available at 140 Bar on request

New combination connection options available: ODS, BW or Braze

Ammonia-Compatible Series 920 & 920R

Now Available in Metric and Imperial Connection Sizes



www.temprite.com

email: temprite@temprite.com

1.800.552.9300

1.630.293.5910

FAX: 1.630.293.9594



▶ PROPANE CHILLERS TRENDING IN EUROPE

Propane chillers, working with a secondary fluid like glycol or CO₂, are growing in popularity in Europe for such applications as medium-temperature supermarket display cases and commercial air conditioning, according to an Emerson Climate Technologies executive.

"I'm seeing a whole bunch of propane products for commercial and residential use in Europe," said Dr. Frank Rinne, director, application engineering for Emerson Climate Technologies' Aachen, Germany office.

On the residential side, he said, propane is being used in heat pumps located outside a building and circulating warm water inside.

On the commercial side, supermarkets like Waitrose in the U.K. and Colruyt in Belgium are employing propane chillers with glycol or CO₂ for medium-temperature display cases, and self-contained propane freezer cases. Emerson supplies Copeland scroll compressors for these systems.

The medium-temperature and low-temperature systems can be linked, he noted, by cascading the condenser heat from the low-temperature system via a heat exchanger into the compressor of the medium-temperature unit. Rinne called this a "propane-propane cascade system."

For the propane chiller, there is no charge limit in Europe if the propane is confined to the outside or to a machine room. Individual self-contained cases have a charge limit of 150 g, and a total charge limit of 1.5 kg "if the room is big enough," said Rinne.

If a case has more than 150 g, then a risk assessment can be done by independent consultants to show that the case is safe in a particular store location in the event of a leak, he noted. The local workplace safety authority would have to approve the assessment.



AMMONIA

LOW-CHARGE AMMONIA, FOR COLD AND HEAT

Johnson Controls is having success in the European market with a compact, low-charge-ammonia chiller and a comparably low-charge-ammonia heat pump, named ChillPAC and HeatPAC, respectively.

ChillPAC's 20 models range in ammonia charge from 13 kg (29 lbs.) to 49 kg (108 lbs.). They can be employed as a chiller (below 32 °F) or an air conditioner (above 32 °F). Using Sabroe reciprocating compressors, the units range from 90 kW to 1,398 kW in capacity. In chiller applications, they use glycol as a secondary fluid while in air conditioning applications, they employ water.

"The ChillPAC is very popular throughout Europe," said Torsten Nadolski, sales manager, central region, Sabroe Products division of Johnson Controls Systems & Service, Mannheim, Germany. In particular, it is being employed in cold storage applications and in hospitals, he noted.

Meanwhile, the HeatPAC is being applied "more and more for heating and ventilation, especially in Switzerland, due to the government rules and regulations," said Nadolski. With capacity ranges from 240 kW to 1,149 kW, HeatPAC's six models contain from 20 kg (44 lbs.) to 48 kg (106 lbs.) of ammonia charge.

ALFA LAVAL DEBUTS NH₃/CO₂ HEAT EXCHANGER

With ammonia/CO₂ cascade refrigeration systems gaining traction in both industrial plants and some supermarkets, Alfa Laval, the Swedish component maker, has introduced a compact NH₃/CO₂ plate-and-frame heat exchanger that is attached to its U-Turn ammonia separator.

"Ammonia/CO₂ cascade systems are growing," said Tommy Ångbäck, business unit manager, refrigeration, for Alfa Laval's Equipment Division. "For that we have developed a new compact system with a very small ammonia charge." The heat exchanger condenses CO₂ while evaporating NH₃.

Alfa Laval would like to help move ammonia technology into "smaller plants, large supermarkets, and residential areas," said Ångbäck. The company is marketing the system globally.

Smaller versions of the NH₃/CO₂ heat exchanger/separator displayed at Chillventa are already installed in cold storage facilities and slaughterhouses, "where you need different temperatures," said Malin Bengtsson, central communication manager for Alfa Laval's Industrial Equipment division. ■ MG



ATMO business case sphere natural refrigerants

June 5-7, 2017 – San Diego

JOIN ATMOSPHERE AMERICA 2017
North America's hub for
natural refrigerant technology and trends

FREE ENTRANCE FOR END USERS

EARLY
BIRD
SPECIAL

SAVE \$350
UNTIL DEC 31

www.atmo.org/America2017



@atmoevents



ATMOsphere - NATURAL REFRIGERANTS FASTER TO MARKET

FOR QUESTIONS AND SPONSORSHIP REQUESTS CONTACT US AT:

info@atmo.org

Hillphoenix Surpasses 200 Transcritical Systems

The OEM has been especially busy this year, producing approximately 75 transcritical racks so far, including the new, smaller AdvansorFlex unit.

– By Michael Garry

The number of supermarkets in North America that run transcritical CO₂ refrigeration systems is still fairly modest – somewhere north of 300 – compared with other parts of the world, particularly Europe.

Still, supermarkets in North America have only been using transcritical systems since 2009, when Sobeys began installing them in Canada; the first U.S. installations started in 2013.

One of the key OEMs supplying these systems, particularly in the U.S., is Hillphoenix; the Conyers, Ga.-based company has produced more than 200 of them, typically one per store, with some going in industrial plants, according to Scott Martin, director of sustainable technologies, Refrigeration Systems Division at Hillphoenix.

“It’s pretty exciting to watch it grow,” said Martin.

Hillphoenix has been especially busy making transcritical racks in 2016, producing approximately 75 so far; the company will end the year with close to 250 total units.

The 2016 production comprises the standard Advansor-brand transcritical rack system, built in multiple compressor configurations up to an 8 x 4 configuration (eight medium-temperature compressors and four low-temperature compressors); Whole Foods Market and Roundy’s, for example, have installed a number of these units. Independent grocers operating a handful of stores, such as DeCicco & Sons, Pelham, N.Y., have also been purchasing Hillphoenix’s transcritical systems.

Hillphoenix has also been producing a smaller unit introduced in December 2015 called AdvansorFlex, which uses a 3 x 2 compressor configuration and less expensive components to bring its price closer to that of HFC technology. Designed for smaller stores, AdvansorFlex has been installed in 365 by Whole Foods outlets. (See [“Downsized Transcritical Unit Lowers First Cost of Equipment,” Accelerate America, March 2016](#))



Scott Martin (on the left) and Michael Garry

GETTING THE COST DOWN

Declining costs have helped drive some of the transcritical sales this year, said Martin. “We have been working really hard to get the cost down.” (The price of individual transcritical systems usually varies by installation, he noted.) But it is still difficult getting UL approval for less expensive components widely used in European transcritical installations that could further reduce costs. (See [“Hillphoenix’s Components Quest,” Accelerate America, September 2015.](#))

Transcritical systems typically offer better energy efficiency than HFC counterparts, helping to pay down the extra cost of the equipment. Even in warm southern locations like Georgia, Alabama and Florida, Hillphoenix’s transcritical systems have been running efficiently thanks to the use of adiabatic condensers, said Martin; the cost of those condensers has been dropping as a result of more competition among suppliers. Martin said he sees more opportunities for energy-efficiency incentives from utilities that would also help defray the cost of transcritical technology.

In addition to benefitting from the efficiency of the transcritical systems, more end users are leveraging the heat reclaim offered by the technology, Martin noted.

The phasing out of HFCs like R404A by the U.S. Environmental Protection Agency is also helping to spark transcritical sales. “This latest phaseout of our common refrigerants is really having an impact and driving retailers to look at more long-term and natural solutions,” said Martin.

Some end users of transcritical systems have reported experiencing CO₂ leaks. In one case Hillphoenix found that what appeared to be a leak was actually the result of a technician “blowing out” the CO₂ charge during routine maintenance. “Because CO₂ is a natural refrigerant, it is less costly for contractors to not bother reclaiming the refrigerant during a service call,” Martin explained.

But some early transcritical systems also lost charge due to faulty fittings, which have gradually been replaced. “it’s the growing pains of the technology,” said Martin. ■ MG



AHR EXPO[®]

THE WORLD'S
LARGEST HVACR
MARKETPLACE



LAS VEGAS JAN 30-FEB 1 2017



→ REGISTER NOW | FREE FOR A LIMITED TIME | AHREXPO.COM

The Hillphoenix-Advansor Connection

U.S.-based Hillphoenix meets regularly with its more experienced Danish subsidiary to share information and gain insights into transcritical CO₂ technology

– By Michael Garry

Hillphoenix's acquisition of the Danish transcritical CO₂ system manufacturer Advansor in 2011 started it on the road to becoming a leading manufacturer in its own right of transcritical systems in North America, with more than 200 units in supermarkets and some industrial plants ([See page 56](#)).

While Hillphoenix's initial transcritical racks were made in Denmark, Hillphoenix, based in Conyers, Ga., and Advansor now run their transcritical operations independently in two marketplaces divided by an ocean. But the two companies maintain a working relationship to stay on the same page and share technology insights, said Kim Christensen, managing director, in an interview with *Accelerate America* at the Chillventa 2016 trade show in Nuremberg, Germany, last month.

"What we try to do is have technology meetings every week so information on any new components and new designs is exchanged," he said. "We should be aligned on the use of different components and try to consolidate to one or two suppliers."

Advansor, with a decade of experience marketing transcritical CO₂ systems and 2,500 racks in operation across at least 1,800 European supermarkets, is positioned to help Hillphoenix with any issues related to the technology, Christensen noted.

By operating in Europe, Advansor has certain advantages. It is able to incorporate component technology that is readily available and has become more affordable in a mature marketplace. Hillphoenix, by contrast, is not always able to secure these European-based components if they have not been UL certified, noted Scott Martin, Hillphoenix's director of sustainable technologies.

In Europe, about 2,500 transcritical racks are produced annually, including about 600 by Advansor. The much larger production scale in Europe means that for a transcritical system in a 16,15 sq.-ft. (1,500 sq.-m) store "we are at price parity" with a comparable HFC refrigeration system, said Christensen.

There is still a price gap between the two technologies in the U.S., he said. "The U.S. is where we were six or seven years ago."



Heating and air conditioning cassette (center), attached to Advansor Valuepack transcritical system.

COMPARABLE SYSTEMS

In North America, Hillphoenix markets its standard Advansor-brand transcritical rack system, along with a smaller version called AdvansorFlex.

Advansor, too, has a standard compSUPER system (80 kW to 300 kW) and a downsized version for smaller stores called the Valuepack (up to 80-90 kW), which is its highest volume rack with 300 units per year; both employ technology comparable to the U.S. versions.

But Advansor offers other models as well. These include a larger industrial version called the compINDUSTRI, and a SIGMA Valuepack system that includes a cassette offering heating and air conditioning functions. Advansor has also developed a small CO₂ condensing unit (10 kW or less) for retailers and pharmaceutical companies.

Christensen believes that with technical enhancements, "there is no limit on ambient temperature" for a transcritical rack. For example, hundreds of Advansor's transcritical racks have a parallel compressor (compared to one Hillphoenix installation in the U.S.).

Subcoolers are also often used, and in climates with many high-temperature hours, he recommends using an adiabatic condenser. Advansor also offers a gas ejector, and is developing a liquid ejector.

"What is important for Hillphoenix now is to get more parallel compressor systems operational like we did four years ago and put that into the market," he said. "That would be by far their biggest gain. Then on top of that they can follow our lead with ejectors." ■ MG

Let's make the switch

The natural next step in supermarket cooling



With its low global warming potential (GWP) and capability to recover heat at high temperature, CO₂ is the natural refrigerant for green supermarket cooling systems. What's more, the heat recovered by a transcritical CO₂ refrigeration system can be used for tap water and space heating. Equipment from Alfa Laval makes transcritical and cascading CO₂ systems greener, more efficient, reliable and safe.



Semi-welded
plate heat exchangers



Brazed plate
heat exchangers



www.alfalaval.com/make-the-switch



Steve Jackson, PermaCold Engineering

'Our Planet – Our Responsibility'

PermaCold Engineering has established a track record for implementing green industrial refrigeration projects like low-charge ammonia and CO₂. *Accelerate America* talks to the man behind the mission

– By Marc Chasserot and Michael Garry

Contractor PermaCold Engineering, in its design, installation and maintenance of industrial refrigeration systems, prides itself on providing energy-efficient, environmentally safe systems.

"We are committed to pursuing the latest technologies and embodying our slogan, 'Our Planet – Our responsibility,'" the 23-year-old company says on its website.

Examples of this approach include PermaCold's collaboration with Henningsen Cold Storage on its low-charge ammonia refrigeration designs ([see page 32](#)), and its consideration of CO₂ systems when planning a new facility or retrofit, as well as its focus on capacity optimization and load shedding.

In this interview with *Accelerate America* at his headquarters in Portland, Ore., Steve Jackson, PermaCold's president and senior managing partner and a 45-year industry veteran, discusses the company's strategies and ideals.

Accelerate America: How did you get started working with Henningsen Cold Storage on low-charge ammonia systems?

Steve Jackson: The Henningsen projects started out with engineers talking. We do an awful lot of work with Henningsen, particularly with Paul Henningsen, the corporate engineer, and Pete Lepschat, engineering services manager. Pete's an interesting guy – he questions everything. So he asks why do we have 20,000 pounds of ammonia here, 30,000 pounds there – why do we need all of this? So he worked with our vice president Randy Cieloha on reducing that charge. ▶

The wind of change...



...born from engineering creativity and ingenuity comes a new, exclusive, patented process which will change the landscape in refrigeration technology.

Our new low charge central system design will create greater safety and security for your employees, greater protection from inventory damage, and greater peace of mind knowing

you have installed the highest standard of industrial refrigeration equipment.

Discover the new world of industrial refrigeration. Specify Frick.

Frick[®]
INDUSTRIAL REFRIGERATION

**Low Charge
Central System**

frickrefrigeration.com/winds-of-change

Johnson
Controls 

Johnson
Controls

“'Because it's the right thing to do' should be the only reason we do it.”



Steve Jackson, PermaCold Engineering

AA: **What did they come up with?**

SJ: This isn't like NXCOLD or Evapcold, where units are shipped in. They looked at everything [in a conventional system]. Why do we need that vessel? Why do these lines have to be so big? Why can't we take [oil cooling] heat and do something with it? So the whole project was, let's see if we can do something smarter. And we were trying to get below the threshold of 10,000 pounds of ammonia to make it a little safer, and we did. We're replicating this in a new [Henningesen facility] in Salem, Oregon.

AA: **How did you get started with CO₂ refrigeration?**

SJ: When CO₂ was first being used, I thought it was nonsense. I wasn't interested but then I read something on the internet about what's going on in Japan and a light went on. I realized, this industry [CO₂] isn't coming to attack mine; it's about the synthetic refrigerants [like R22 that depletes the ozone layer].

AA: **What are you doing to improve energy efficiency?**

SJ: Load shedding – reducing the amount of refrigeration required. We put together a symposium a couple of years ago where our corporate engineer modeled a 100,000-square-foot cold storage facility built in 1980 and one built in 2013. We brought all of our engineers and salespeople in, and we brought in manufacturers of panels, doors, controls, and lighting. We showed them that we were able to reduce the load from 1980 to 2013 by 58%.

AA: **How has your company been impacted by regulations?**

SJ: When OSHA and EPA came into our life, all of our energy was spent complying with this, designing to that. For about 15 years, that's all we did. But the regulatory stuff is easy because the federal government is writing all of the text for you. It appeals to people who don't really want to do the hard work. I want to be ahead of regulations; I want them to write their manuals based on how we do things, because we do it better.

AA: **How are you bringing your approach to new technology and load shedding to your customers?**

SJ: Not all customers are willing to do it. What's holding us back is getting people to open up to this. It's hard work; you have to sit and do the engineering. When I hired Jeff Buxton [EIT – energy conservation manager], I didn't let him talk to anybody in this building but me. Now, two-and-a-half years later, he's an expert in this. We didn't let him fall into the trap of thinking, "This is how I've always done it – why would I want to change it?"

AA: **How did you develop your philosophy?**

SJ: I think it was the nuns at St. Stephen's that taught me that our goal on this planet is to get up tomorrow and make it better than it was yesterday. And I've believed that my whole life. We're breathing fresh air and drinking clean water but it's not as fresh and clean as it was when I was a child. If we continue down this path, what will my great-grandchildren be breathing and drinking? I care about that.

I was with a guy last night who was going through a list of why we should do something. I told him at the bottom of the list write, "because it's the right thing to do." He looked at me and said, "my boss doesn't care about that." I told him your boss really does care about that, and if you want, have your boss call me and I'll talk to him. "Because it's the right thing to do" should be the only reason we do it. I truly believe that. ■ MC & MG

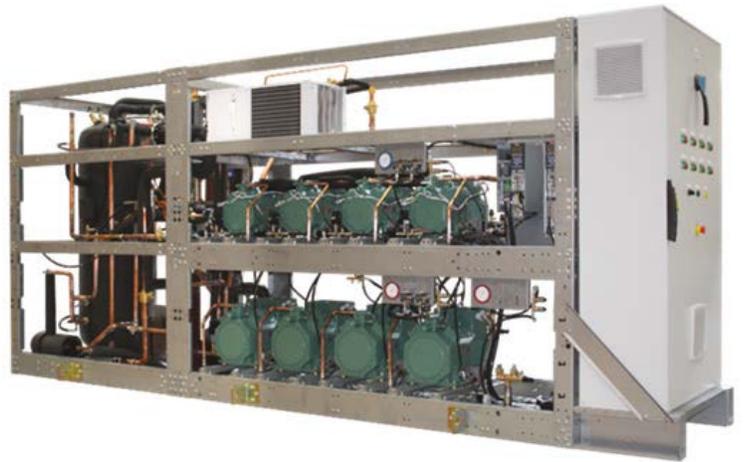
KYSOR/WARREN

THE COMPLETE
SUPERMARKET
SOLUTION PROVIDER.
DISPLAY CASES / RACKS SYSTEMS

expect more.

When investing in an HFC-free refrigeration system, you should expect sound guidance, more options, superior equipment and unparalleled customer service. Contact us today to learn more about our innovative ammonia cascade system, that uses only **53lbs/24kg** of ammonia to produce 70 tons of refrigeration, or our global CO2 transcritical system currently being installed worldwide. With Kysor/Warren, your expectations are reality.

Expect more with Kysor/Warren.



Transcritical CO2 Booster Rack



Ammonia CO2 Cascade

Find us on...



[KysorWarrenRefrigeration](https://www.kysorwarren.com)



KYSOR/WARREN

www.kysorwarren.com



ACCELERATE

ADVANCING HVAC&R NATURALLY

A M E R I C A

Accelerate America is published 10 times per year by shecco America. All issues are available in digital form at AccelerateNa.com. Printed copies are mailed to end users and other key HVAC&R industry players, and are distributed at key industry events.*

Issue #20

November-December 2016

Publication date: Nov. 21

Focus: Top 20 Movers & Shakers

Ad submission date: Nov. 11

Issue #21

January 2017

Publication date: Jan. 11

Focus: California: The Epicenter for NatRefs in the U.S.

Distribution: AHR Expo, Jan. 30-Feb. 1.

Ad submission deadline: December 29

Issue #22

February 2017

Publication date: Feb. 6

Focus: Foodservice (propane), Industrial Refrigeration (low-charge ammonia)

Distribution: The NAFEM Show,

Feb. 9-11; IIAR Natural Refrigeration

Conference & Heavy Equipment Expo, Feb. 26-Mar. 1.

Ad submission deadline: Jan. 30

Issue #23

March 2017

Publication date: Mar. 7

Focus: Industrial Refrigeration (low-charge ammonia and CO₂)

Ad submission deadline: Feb. 27

Issue #24

April 2017

Publication date: April 5

Focus: HVAC: Progress in North America

Ad submission deadline: March 27

Issue #25

May 2017

Publication date: May 3

Focus: Utilities & Incentives

Ad submission deadline: April 24

Issue #26

June 2017

Publication date: June 5

Focus: NatRefs vs. HFOs

Distribution at ATMOSphere America, June 5-7

Ad submission deadline: May 31

Issue #27

July-August 2017

Publication date: July 18

Focus: *Accelerate America* Award Winners

Ad submission deadline: July 11

Issue #28

September 2017

Publication date: Sept. 12

Focus: Food retail: CO₂ vs. propane

Distribution at FMI Energy & Store

Development Conference, Sept. 24-27

Ad submission deadline: Sept. 5

Issue #29

October 2017

Publication date: Oct. 17

Focus: CO₂ in mobile air conditioning

Ad submission deadline: Oct. 10

Issue #30 (Vol. 4)

November-December 2017

Publication date: Nov. 28

Focus: Top 20 Movers & Shakers

Ad submission deadline: Nov. 21

Publisher Marc Chasserot
marc.chasserot@shecco.com
[@marcchasserot](https://twitter.com/marcchasserot)

Editor Michael Garry
michael.garry@shecco.com
[@mgarrywriter](https://twitter.com/mgarrywriter)

Reporter Mark Hamstra
mark.hamstra@shecco.com

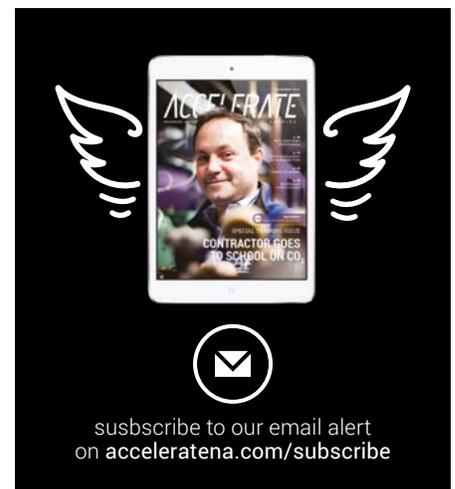
Contributing Writers Pilar Aleu
Jan Dusek
Nina Masson
Charlotte McLaughlin
James Ranson
Klara Skacanova
Andrew Williams

Events Coordinators Silvia Scaldaferrì
Anastasia Papagiannopoulou

Art director Mehdi Bouhjar

Graphic Designers Charlotte Georis
Anna Salhofer
Karolina Klat

Photographer Anna Salhofer



Accelerate's network of offices stretches from New York and Brussels to Tokyo and Melbourne. Accelerate America is published monthly except for a mid-year and year-end double issue. The views expressed by the contributors are not necessarily those of the Publisher. Every care is taken to ensure the content of the magazine is accurate but we assume no responsibility for any effect from errors or omissions.

Published by shecco America Inc. All rights reserved. Reproduction in whole or in part is prohibited without prior written permission of the copyright owner.