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SOWING THE SEEDS OF CHANGE

— Editor's Note by Andrew Williams

It is over three years since the first edition of our *Accelerate Australia & NZ* magazine was published in autumn 2016. In that time much has changed in the HVAC&R industry, both here in Australia and New Zealand, and in the wider world.

The Kigali Amendment to the Montreal Protocol, for example – which entered into force on 1 January this year – will help to reduce the production and consumption of HFCs worldwide. With a view to future-proofing their businesses, many local users of HVAC&R equipment have already begun to adopt or consider adopting natural refrigerant-based alternatives instead.

On the technology side, new innovations both here and abroad are helping to overcome some of the cost and performance barriers that have perhaps hindered wider uptake of these systems here in Australia.

This issue's cover story looks at the foundations that have been laid for natural refrigerant growth in this corner of the world (p. 20). Our ATMOSphere Australia conference in May is a great platform to discuss these issues in more detail (p. 32).

The most successful business leaders know that anticipating change keeps them ahead of the game. With its global reach, the Roche Group understands the responsibility it shares to help put the world on a more sustainable path. Hence the multinational biotechnology company's decision to phase out halogenated refrigerants (p. 16).

Closer to home, Fung Lea Food – a New South Wales-based importer and processor of seafood, poultry and other products – has opted for an NH₃-CO₂ cascade system at premises in Prestons (p. 58).

An air-to-water, CO₂-based heat pump is saving energy at Tasmania's Shene Estate and Distillery (p. 30). Emerson's Tim Flinn, meanwhile, is upbeat about the market prospects for natural refrigerants in Australia and New Zealand (p. 56).

Last year, Lidl France opened its first supermarket to use propane for 100% of its cooling needs. Since then and from now on, each of the retailer's new stores uses this natural refrigerant (p. 36).

In the United States, Texas grocery chain H-E-B reports on the performance of propane display cases in its pioneering outlet in the warm climate of Austin (p. 26). The Campbell Soup Company, which pioneered low-charge ammonia systems, has added cascade and transcritical CO₂ technology to the mix (p. 44).

Ajinomoto is seeking to phase out HCFC and HFC use throughout its business by 2030 (p. 40). The frozen food manufacturer was proud to be among the winners of our *Accelerate Japan* awards for natural refrigerant leadership at our recent ATMOSphere Japan conference (p. 52). Coverage of AIRAH's Refrigeration 2019 conference helps to complete this edition (p. 48).

Thank you as always for your loyal readership. I wish you all a fruitful and enjoyable ATMOSphere Australia 2019.



Andrew Williams
Editor



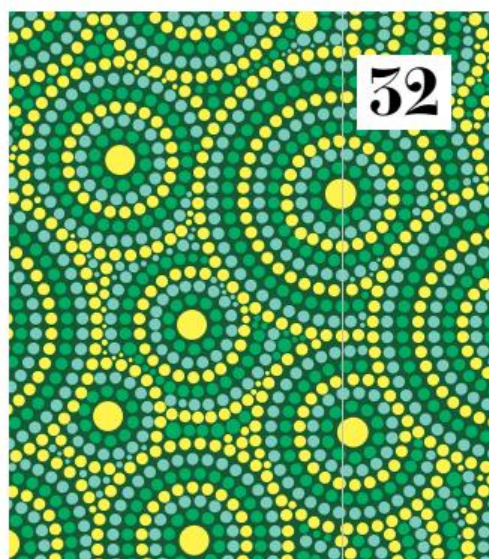
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ACCELERATE

ADVANCING HVAC&R NATURALLY

A U S T R A L I A & N Z

About *Accelerate Australia & New Zealand*

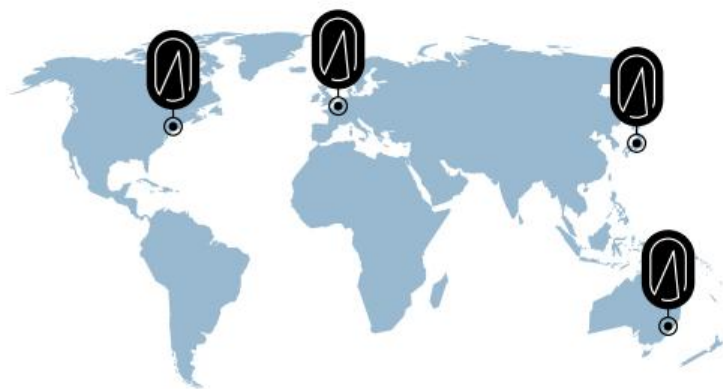
Brought to you by shecco, the worldwide experts in natural refrigerant news, *Accelerate Australia & NZ* is the first quarterly news magazine written for and about the most progressive business leaders working with natural refrigerant solutions in all HVAC&R sectors.

The *Accelerate* family of magazines includes editions in Europe, America, Japan, China, Asia, and Australia & New Zealand.

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#GoNatRefs



MAY-JUL

8-9.05

**ATMOsphere Australia 2019
Melbourne, Australia**

The Australian edition of the ATMOsphere conference series on natural refrigerants, organised by Accelerate publisher shecco.



<http://www.atmo.org/events.details.php?eventid=77>



@ATMOEvents #ATMOAustralia

2-3.05

**2019 HVAC&R Trade Exhibition
and Industry Conference
Auckland, New Zealand**

This year's conference theme is 'A New Era Uncovered'.



<https://www.irhace.org.nz/events-sponsors/event-list/>



10-11.05

**8th World Climate Congress
Bangkok, Thailand**

This year's conference theme is 'Tackling Climate Change for a Sustainable Future'.



<https://climatecongress.conferenceseries.com>

10-12.07

**Indonesia HVACR & Energy
Efficiency Expo, Grand City
Convention & Exhibition,
Surabaya, Indonesia**

This event displays the full spectrum of products, technology and services for air-conditioning, refrigeration, ventilation, heating and energy-efficiency solutions in buildings.



<http://ina-hvacrcoldchain.com>



24-26.07

**Cold Chain Philippines
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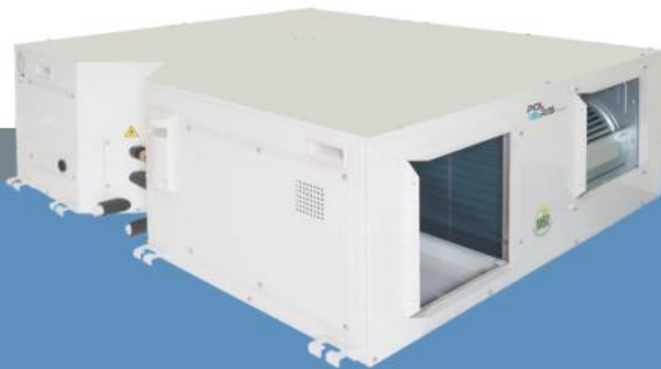
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AUSTRALIA & NZ IN BRIEF

Epta acquires Kysor Warren

On 1 April, Italian OEM Epta S.p.A announced the acquisition of Kysor Warren from US conglomerate Lennox International. The purchase will result in the creation of a new company called Kysor Warren Epta US Corp. The \$49 million (AU\$69m) cash deal closed on 29 March 2019.

Kysor Warren makes refrigerated merchandisers and systems – including transcritical CO₂ and ammonia/CO₂ cascade systems – for food retail stores, as well as other sectors. It operates in the US and Mexico.

Epta is a leading manufacturer of CO₂ refrigeration systems in Europe. It is now marketing CO₂ technology in Australia, South America and Southeast Asia. The Kysor Warren acquisition gives Epta a foothold in North and Central America too. ■ MG

Mayekawa announces new CO₂ condensing unit

In March, Mayekawa announced the release of a new CO₂ condensing unit aimed at low-temperature storage and food processing facilities in Japan.

The system, dubbed 'Kopel', is an air-cooled packaged unit that is "ideal for cold storage warehouses and food factories," the company's website states.

Mayekawa is also offering a new NH₃/CO₂-powered thermal ice storage system in collaboration with Baltimore Aircoil Company (BAC) Japan, as announced in February at ATMosphere Japan, a conference organised by Accelerate publisher shecco.

■ DY

New NatRef awareness-raising initiative launched

The North American Sustainable Refrigeration Council (NASRC) has launched a new movement called Naturally Cool, to raise awareness about natural refrigerants and how they benefit the environment.

NASRC is a non-profit organization focused on taking action to eliminate barriers preventing the adoption of natural refrigerants in supermarkets.

"Over the past three years, we've received tremendous support from supermarket industry stakeholders, who have been the driving force behind our accomplishments to date," said Danielle Wright, executive director, NASRC.

"What we've realised is that a lack of awareness of natural refrigerants outside of the industry is slowing our impact. We're trying to change that with Naturally Cool."

■ MG

China phases out 280,000 tonnes of ODS

China announced on 19 March that it had phased out a total of 280,000 tonnes of ozone-depleting substances (ODSs), according to Xinhua news organisation.

The Ministry of Ecology and Environment made the announcement at a seminar on implementing the Montreal Protocol, held in Beijing on 18-19 March.

"The Chinese government has no tolerance for any illegal production of ODSs," said Guo Jing, a senior ministry official. Jing said China would "continue to fulfil its promise and strengthen its supervision of the controlled substances to achieve its goal".

■ DY

Japan increases low-GWP technology subsidy

A Japanese government subsidy to accelerate the development of low-GWP HVAC&R technology will increase to AU\$8.2 million (¥650m) in financial year (FY) 2019 from AU\$3.15 million (¥250m) in FY 2018.

"METI is currently intensively engaged in a number of initiatives aimed at developing [low-GWP HVAC&R] technology," said Hideyuki Naoi, deputy director, METI, who announced the increase. This subsidy is part of a five-year plan that runs from 2018 until 2022.

■ DY

IIAR hydrocarbon-standard effort underway

The standards committee of the International Institute of Ammonia Refrigeration (IIAR) has begun work on a safety standard for hydrocarbon refrigerants in commercial and industrial applications, including chillers and heat pumps.

Though traditionally focused on ammonia, IIAR "is fully capable of developing ANSI-approved safety standards for hydrocarbons," said Bruce Nelson, president of Colmac Coil Manufacturing, and chairman of an IIAR task force that looked into developing a hydrocarbon standard last year.

"A hydrocarbon safety standard – which is needed and missing – fits our mission to make the world a safer place," Nelson said.

■ MG

Polaris launches new hydrocarbon AC unit

Polaris Technologies, based in Frenchs Forest, New South Wales, has launched a ducted air-conditioning unit based on natural refrigerant propane (R290) in a hydrocarbon blend.

The first units – part of the HideAway Series – were delivered to Australia in March. Sales have already begun, and the first installations were made that same month, in Melbourne and Sydney.

The Polaris HideAway series of air conditioners are ducted packaged units that do not require a separate outdoor unit. "This opens new possibilities for designers and architects who can now dispense with unsightly exterior units," Tony Power from Polaris told this magazine.

The refrigerant used is engas M60, a special purpose hydrocarbon refrigerant blend specifically designed to replace R410A. Propane is its primary ingredient.

The air conditioners had been under development for over five years. Early prototypes used R410A, but these did not meet Minimum Energy Performance Standards (MEPS) that are mandatory in Australia and New Zealand.

"The hydrocarbon refrigerants are the only reason the Polaris HideAway systems were capable of passing MEPS," said Power.

Power is optimistic that choosing natural refrigerants will help the company to market the new units. "We see big opportunities for this [product]," he said, citing early interest from large healthcare groups and developers.

"We're currently setting up agents across Australia and are open to new distributors, including in territories outside Australia," Power said.

The units are compact, making them an attractive option for use in buildings. "The 3.5 kW unit is only 300mm high. Architects love that," said Power. "We also saw an opportunity to build a cyclone-proof unit – there has been strong interest immediately from Fiji, for exactly that reason."

■ AW

\$2m grant issued for mobile training unit in Australia

The government in the Australian state of Victoria has issued an AU\$2 million grant for the design and construction of a mobile training module for refrigeration systems using ammonia, CO₂, and flammable refrigerants.

Gayle Tierney, the Victoria State Government's minister for training and skills, made the announcement on 15 March, according to Australian Refrigeration Association (ARA) President Ian Tuena.

Tuena gave a presentation about the grant at AIRAH's Refrigeration 2019 conference, held on 25-26 March in Melbourne at Marvel Stadium.

Tuena said that the grant was the result of an effort led by industry associations ARA and the Australian Refrigeration Mechanics Association (ARMA), which originally pitched the mobile training concept.

The concept has already received endorsements from several other major industry associations such as the Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH) and the Australian Refrigeration Council (ARC), and from leading end users such as Coles.

The lack of trained technicians is widely recognised as one of the biggest barriers to the uptake of natural refrigerant-based technology in Australia.

"We hope it will eventually become a part of a national skills-based qualification which will underpin what we would like to see in the industry as a statutory licensing regime nationally throughout the country," Tuena said.

The mobile training units are being designed locally, led by Jonathan Hare – a refrigeration engineer at Australia-based contractor the Natural Refrigerants Company, which represents Advansor in the country. Training is slated to begin in 2020.

■ DY

Stable operation for Woolworths CO₂ TC system in heat wave

Demonstrating the increasing viability of transcritical CO₂ systems in warm climates, leading Australian retailer Woolworths recently presented data showing stable performance of one of its transcritical CO₂ systems in a supermarket near Sydney during one of Australia's most severe heat waves, in January.

"On 25 January, we had a significant heat event in Sydney," said Dario Ferlin, Woolworths' sustainability engineer, at AIRAH's Refrigeration 2019 conference, held on 25-26 March in Melbourne.

"We had seven consecutive days over 35°C – of which five days were over 40°C. The final day was our peak day, where we hit just over 46°C on the condenser deck," Ferlin said.

The system, in a store in Prestons, New South Wales, was commissioned on 6 December 2018. The transcritical CO₂ system is the first to serve a Woolworths store's entire HVAC&R needs.

Ferlin presented temperature data for low temperature, medium temperature, and store ambient temperature versus outdoor ambient temperature for the period 25 January-1 February 2019.

"We are controlling three climate zones with this transcritical [CO₂] system. The low-temperature system, which is the freezers, the medium-temperature system, which is the chilled product, and the ambient store conditions," he said.

"We had satisfactory climate control conditions in all three climate zones throughout the seven-day heat wave," said Ferlin.

The use of adiabatic cooling plays a key role in managing the system's energy use in extreme heat, Ferlin said. "Adiabatics are fundamental to transcritical CO₂ if we are to make any inroads on abating energy consumption," he explained.

■ DY

Perceptions, ideas and beliefs

Perceptions, ideas and beliefs: it's amazing what a change in mindset can achieve.

While on a recent work trip to Europe, my mind was set alight with the brilliant acceptance of change. The European Union has played its hand straight-up in combating the effects of global warming. Wind and solar farms distort the landscape and the endeavour to remove f-gases is ongoing and systematic. There is a distinct aura of responsibility and willingness in Europe to find a better, greener way.

Our short trip involved a visit to Chillventa, the expo for energy efficiency, heat pumps and refrigeration, where we witnessed first-hand the drive to create sustainable solutions for the future. Every second stand involved natural refrigerants, for example CO₂ transcritical racks and propane systems; one guy was even showcasing systems that contained good old H₂O as a refrigerant.

Change was everywhere, and change was commonplace.

Several factory visits later, and our initial perceptions were confirmed: innovation and belief. And the most amazing thing was that people weren't scared of transcritical CO₂ systems. The demand for the natural solution is huge. Manufacturers can't keep up.

We have installed many hybrid CO₂ systems for major retailers in Queensland, but our climate has limited the use and acceptance of transcritical. With updates to technology, confidence and the continued promotion of all things non-synthetic, that should change very soon. We are ready for it, and we look forward to it.



Ricky Gatti
Coolphase Pty. Ltd.

Ricky Gatti is general manager of Coolphase Pty. Ltd., an Australian HVAC&R contractor active in commercial refrigeration and air conditioning. He has enjoyed a long career in the refrigeration industry.

Some of the biggest 'natural' challenges in the Australian industry are the lack of training and a lack of willingness to accept something different. Technology changes by the minute. Our labour force can't keep up with demand. And some people are passionately set in their old ways.

Our sector of the industry, 'supermarket refrigeration', has seen a decline in the employment of apprentices; the next generation of support will not be there when the current ageing collective of fridges retires. Not an ideal situation when we are about to enter our biggest period of change since the phase-out of CFCs. It is important that we train and provide opportunity. Our customers need it and our people need it.

Changing mindsets can always be difficult, especially when people don't see the benefits. As industry leaders we constantly need to educate, and show the way.

*"A leader is one who knows
the way, goes the way,
and shows the way."*

— John C. Maxwell

At Coolphase, it is our continued focus to train and to prepare our people for what's to come. We are fortunate to have great supply partners in Bitzer, Beijer Ref and Heatcraft who have all offered members of our staff transcritical training. We are also fortunate to have a great team of leaders that can 'lead our people through change' and help with any challenges that may arise. We direct, we change mindsets, and we make natural possible.

We look forward to promoting all things natural whenever we can. We are importing our own line of propane (R290) refrigeration cabinets (which we can't wait to get out to our customers), we train, and we teach. It's our continued hope that we're part of the natural movement and we can help champion change.



ATMO CHINA

11-12 April 2019
Shanghai

ATMO AUSTRALIA

8-9 May 2019
Melbourne

ATMO AMERICA

17-18 June 2019
Atlanta

ATMO ASIA

24 September 2019
Bangkok

ATMO EUROPE

16-17 October 2019
Warsaw

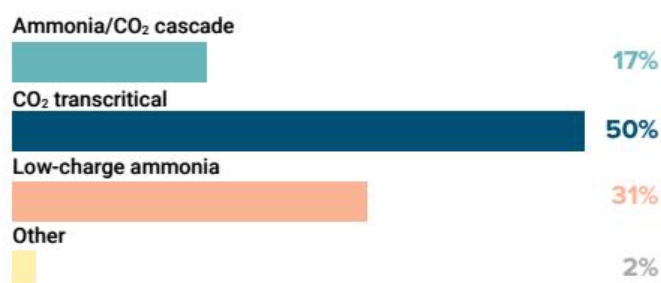
ATMO JAPAN

10 February 2020
Tokyo

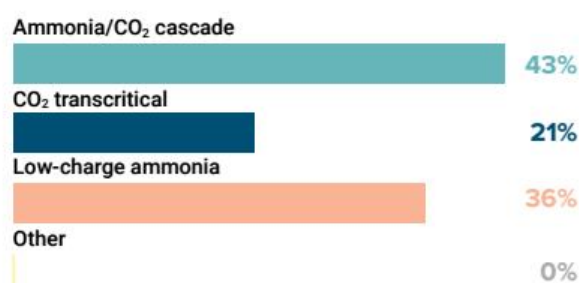
More info on www.ATMO.org

Which natural refrigerant-based technology holds the biggest potential for industrial refrigeration in your region over the next five years?

AUSTRALIA



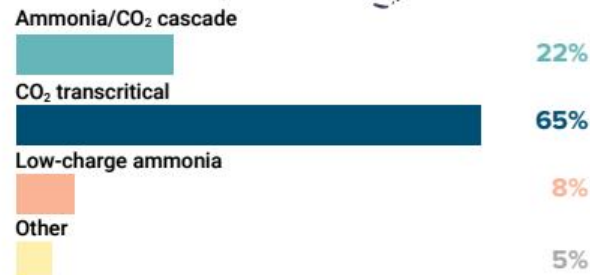
NORTH AMERICA



ASIA



EUROPE



Participants in 2018 ATMOsphere events, a series of natural refrigerant conferences organised by shecco, publisher of this magazine, were surveyed on what natural refrigerant-based technology holds the greatest potential for the industrial refrigeration sector. Their feedback was collated through sli.do polling at ATMOsphere America (28 answers), ATMOsphere Asia (30 answers), ATMOsphere Australia (48 answers) and ATMOsphere Europe (96 answers), held in various locations throughout 2018.



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ROCHE'S CLIMATE REMEDY



From left to right: Roche's Clemens Keiser, Joachim Lemberg, Thomas Wolf, Andreas Hug & Jürg Walder.

Photo: Gabriel Hil

The Roche Group is committed to phasing out halogenated refrigerants. *Accelerate Europe* visits the multinational biotechnology company at its headquarters in Switzerland to hear why natural alternatives are the best medicine for achieving this.

— By Andrew Williams

Bordering France and Germany on its outermost edges, it is little wonder that the city of Basel, Switzerland is an outward-looking place. This easy confidence makes Basel the natural home of multinational biotechnology company F. Hoffmann-La Roche Ltd. (more commonly referred to as Roche), whose high-rise headquarters looks out on all three countries.

The Roche Group, founded in 1896, is split into two different divisions – pharmaceuticals and diagnostics. Focusing on oncology, immunology, ophthalmology, infectious diseases and neuroscience, Roche ranks among the world's leading developers of targeted treatments combined with corresponding diagnostics. It is also a leading provider of clinically differentiated medicines.

Roche Pharmaceuticals is the world's largest biotechnology company and the world's leading provider of cancer treatments.

With its global reach, Roche understands the responsibility it shares to help put the world on a more sustainable environmental path. "Eliminating halogenated substances in all areas is a big step to achieving our goals here," Dr. Joachim Lemberg, Roche's head of safety, security, health and environment (SHE) data analysis and reporting, told *Accelerate Europe* at the company's Basel headquarters.

The Roche Group's commitment to phasing out halogenated refrigerants is governed by the K6 Directive, one of 24 mandatory corporate directives that every part of the Group must follow. Lemberg is part of the team responsible for implementing K6.

Roche is phasing out halogenated refrigerants across its cooling portfolio of laboratory refrigerators, cold stores, walk-in research coolers, stability chambers for product testing, cafeteria equipment, heating, air conditioning, centrifuges, freeze drying, fire suppression systems, packaging foam and data centres.

The company applies the policy of adopting natural refrigerants where reasonably possible to all the above applications.

The K6 Directive guides Roche in discontinuing its use of substances that have a negative impact on the environment caused by ozone depletion, global warming or persistence in the atmosphere with potential long-term negative effects.

"We have a clear target of phasing out these substances 100%," says Thomas Wolf, Roche's chief environmental sustainability officer, who held Lemberg's current position until 2012 and was a key figure in getting Roche's halogenated refrigerant phase-out programme off the ground. "We want to eliminate them completely."

"Other companies harbour similar aspirations to ours, but I can't think of another firm that's as progressive in pursuing these goals as us," Wolf says.

The journey began in the early nineties, when Roche decided to put in place a strategy for dealing with ozone-depleting substances (ODSs). One trigger was the entry into force on 1 January 1989 of the Montreal Protocol on reducing their production and consumption. The Kigali Amendment to the Montreal Protocol – which was signed on 15 October 2016 and entered into force on 1 January this year – retrospectively confirmed the wisdom of Roche's early move to include HFCs in the global phasedown picture.

"We wanted to stay ahead of any potential new legislation in countries around the world," says Lemberg.

The first edition of the K6 Directive was published on 22 September 1994. "This is when we formally adopted the ambition to phase out ozone-depleting substances," Lemberg says.

Roche's primary target was to eliminate ozone-depleting substances: CFCs, HCFCs and HBFCs (hydrobromofluorocarbons) by 31 December 2015, which it nearly achieved. Only small residual amounts were left over, which were then eliminated in 2016.

Starting from 95 metric tonnes, that left 9.5 metric tonnes of fluorinated gases (f-gases) – namely HFCs and PFCs (perfluorinated compounds) – in the Roche Group's inventory. By 2018, there were just 7.5 tonnes of f-gases left. The ultimate goal is to eliminate them all.

While Roche sought to replace ODSs with alternative solutions like natural refrigerants from day one of the K6 programme, in certain cases it installed HVAC&R equipment using HFCs and PFCs as an interim step for business continuity reasons. "But it didn't take long for scientists to discover that fluorinated gases contribute to global warming," Lemberg recalls.

Next, Roche set its sights on completely eliminating its inventory of halogenated refrigerants as well. On 20 December 2002, it formally extended the scope of K6 to target a 100% phase-out of both substance classes – ODSs, and HFCs and PFCs.

When did natural refrigerants come into the picture? Wolf picks up the story. "We began to adopt natural refrigerant systems at the very beginning of the K6 process," he says. "Now we're much stricter about this, after we tightened our approach in the early 2000s."

Scientific uncertainty surrounding the environmental impact of halogenated refrigerants was a key factor influencing Roche's decision to replace them with natural refrigerants instead.

"We decided to eliminate halogenated refrigerants not just because they damage the ozone layer and contribute to global warming, but also because



F. Hoffmann-La Roche headquarters in Basel, Switzerland.

their ultimate impact on the climate and environment is not yet fully understood," says Jürg Walder, global lead – sustainability in the global technical operations department of Roche's pharmaceutical division.

"As a large company, Roche wants to demonstrate that it's an opinion leader on this," Walder says. "We want to go further than what's required by legislation."

Less than 1% of the Roche Group's greenhouse gas emissions come from halogenated refrigerants in refrigeration and cooling plants. Instead, the majority is attributed to the use of energy and for the most part comprises CO₂, according to the company's latest Sustainability Report.

“Eliminating halogenated substances in all areas is a big step to achieving our sustainability goals.”

– Joachim Lemberg, Roche

New business models

Roche strives to apply the precautionary principle in evaluating different technology options. Its HVAC&R portfolio is no different in this regard.

As HFCs are phased down, some users of HVAC&R technologies are turning to hydrofluoroolefins (HFOs) – the new generation of synthetic refrigerants – as replacements. But HFOs are an issue of concern for some environmental agencies.

In 2018, a report commissioned by the Norwegian Environment Agency on the environmental impact of trifluoroacetic acid (TFA) – the atmospheric by-product of HFOs – called for a number of “knowledge gaps” to be addressed before TFA's ultimate effect on the environment could be determined. HFOs' environmental risks will grow with use, the report said, adding that phasing them out will reduce those risks.

Did Roche consider going down the HFO route? Lemberg could not make his opposition any clearer. “No way! We ban them. This is part of our precautionary principle. It's Annex 5 of the K6 Directive,” he says.

Walder is keen to offer his own thoughts. “The chemical companies have had some 30 years to develop a new business model,” he says. “But every new generation of refrigerants they have come up with has harmed the environment.”

He calls on synthetic refrigerant makers to develop new business models based on natural refrigerants instead. “They could involve technology vendors in this, because in most cases, the end user does not buy refrigerants,” he suggests.

As Roche moves towards a 100% phase-out of halogenated refrigerants, soon the group will put in place new targets for the period 2020-2025 – perhaps a reduction by a further 20-25%, Lemberg says. “This will be harder to achieve, because the low-hanging fruits have already gone.”

As natural refrigerants acquire a greater market share, competition between different options is increasing in certain applications. “We use CO₂ for cold chambers, ammonia for big chillers, and hydrocarbons for applications both large and small – particularly for air conditioning in office buildings,” says Walder.

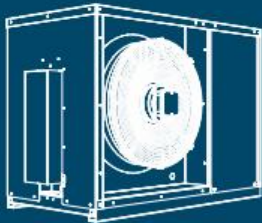
The team is proud of the transformative role that Roche plays in phasing out halogenated refrigerants on such a large scale.

“We're achieving something that's making a huge contribution to what the company wants to achieve,” says Lemberg. “We can see the outcome, and it's rewarding.”

■ AW

SCM CO₂ Leader

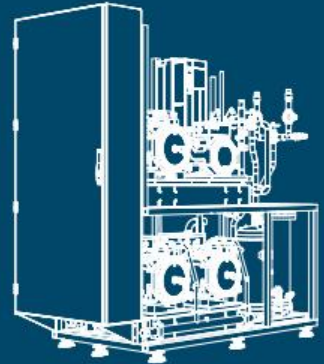
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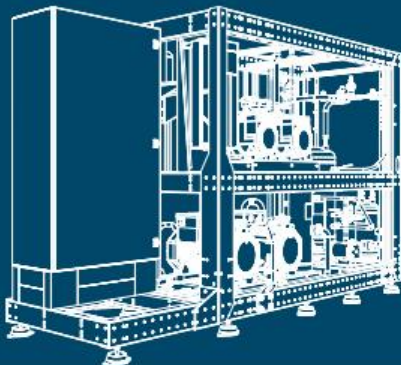
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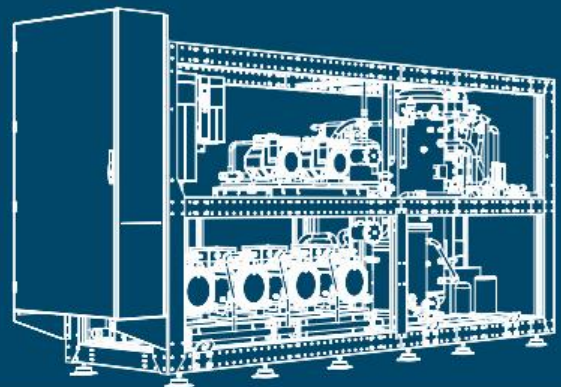
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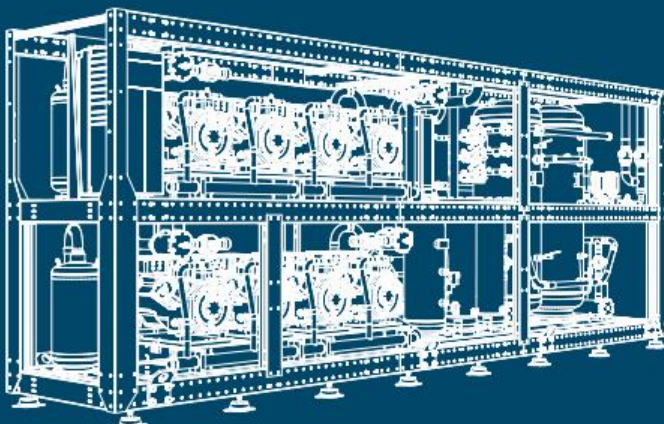
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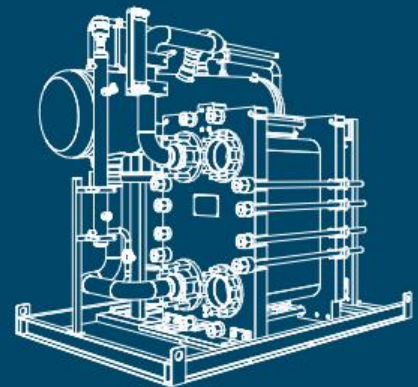
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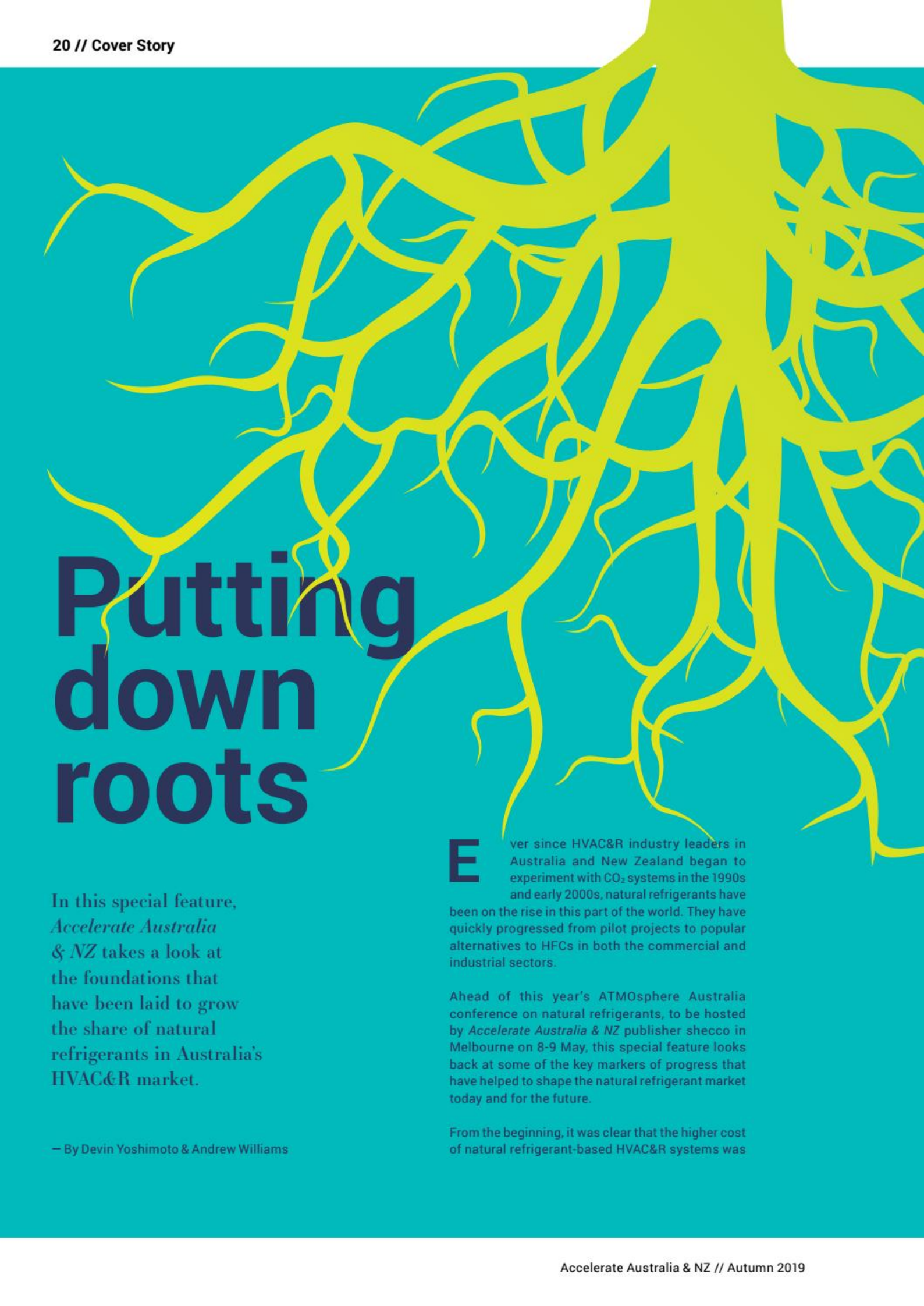
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Putting down roots

In this special feature, *Accelerate Australia & NZ* takes a look at the foundations that have been laid to grow the share of natural refrigerants in Australia's HVAC&R market.

— By Devin Yoshimoto & Andrew Williams

Ever since HVAC&R industry leaders in Australia and New Zealand began to experiment with CO₂ systems in the 1990s and early 2000s, natural refrigerants have been on the rise in this part of the world. They have quickly progressed from pilot projects to popular alternatives to HFCs in both the commercial and industrial sectors.

Ahead of this year's ATMOsphere Australia conference on natural refrigerants, to be hosted by *Accelerate Australia & NZ* publisher shecco in Melbourne on 8-9 May, this special feature looks back at some of the key markers of progress that have helped to shape the natural refrigerant market today and for the future.

From the beginning, it was clear that the higher cost of natural refrigerant-based HVAC&R systems was



“We drove costs down by piggy-backing on bulk suppliers and leading manufacturers globally.”

— Brian Toulson, City Holdings

a barrier that needed to be overcome. “What’s enabled progress is that we saw from the first project that [...] we needed to drive costs down,” Brian Toulson of City Holdings, which takes care of facilities management for leading Australian retailer Coles, told this magazine.

Engaging with overseas suppliers was crucial in reducing costs in those early days. “There was a perception that if we piggy-backed on bulk suppliers and leading manufacturers globally, then we could drive costs down and benefit from their high-volume supplies,” Toulson says.

That is what City Holdings did for Coles. “By going through that process, we substantially reduced costs,” Toulson says. “We went over to see overseas manufacturers in their home countries, and sought commitments from them to bring staff over to help training and commissioning. It worked really well.”

“It has been a fruitful process. It’s brought their technology into this country, and that’s really interesting,” Toulson says.

Engaging local industry

While Coles reduced costs by engaging proactively with international suppliers, Woolworths – another leading retailer – took another approach.

Woolworths opted to engage locally with the HVAC&R industry on site, reducing installation time and standardising equipment. Although this approach did not reduce upfront costs, it did help slash expenditure on risks built into project briefs.

One of the ways it accomplished this was to fully engage local stakeholders in designing, installing and commissioning systems.

Woolworths installed its first CO₂ transcritical system in July 2017, in a store in Colebee, New South Wales (NSW). As training of local industry picked up, familiarity and confidence with transcritical CO₂ systems began to grow (see *'Woolworths building NatRef momentum in Australia,' Accelerate Australia & NZ, winter 2017*).

Standardising equipment, meanwhile, helped to reduce on-site costs. Woolworths' second CO₂ transcritical system, installed in a store in Wadalba, NSW, in July 2018, was built to an e-specification system, helping to reduce installation and on-site risk management costs still further.

Both retailers' approaches have helped pave the way for Australia's wider HVAC&R industry to adopt CO₂ transcritical systems too, by showing how to reduce costs, by facilitating training and by familiarising people with the technology.

Toulson acknowledges the role that Woolworths has played alongside Coles. "Woolworths has started to get on board and turn over projects in the transcritical space, so that kept the local trade fed with workload whilst we were bringing the internationals in," he says.

"They've got more experience under their belts now. We also have more design capability and more service capability [...], so it's better for the whole industry. It's been a good result for the end user," he adds.

Shifting mindset among independents

Not to be outdone by the two leading players, other food retailers active in Australia including Aldi, Drakes and independents have been moving towards natural refrigerants too.

Smaller retailers are forced to be more cost-oriented than bigger players, which are often in a better position to invest in the future. Nonetheless, smaller firms are also mindful of how investing in certain types of equipment today can ultimately save costs in the long run. Discussions about future-proof technologies are therefore opening the door to natural refrigerants.

Petar Lujic, owner of IGA Market Central, summed up this sentiment in outlining his decision to go with natural refrigerants for a new store opened in November 2017 (see *'One man's vision,' Accelerate Australia & NZ, winter 2018*).

"It means that we can focus far more on running our business as opposed to worrying about efficiency or replacing equipment and changing refrigerants. That's it," Lujic said.

Lujic is CEO of Kamen Group, a business involved in developing supermarkets, liquor outlets, hotel accommodation and other various types of property.

Smaller businesses must rely more heavily on trusted refrigeration contractors to provide them with the information they need to make the right equipment purchases.

In this case, Lujic's contractor was AJ Baker. Mike Baker, AJ Baker's managing director, argues that Australia has a responsibility to adopt natural-refrigerant systems. He describes them as competitive options that protect certain businesses from long-term risks.

"Both the owner and AJ Baker wanted the store to be future-proof, so CO₂ was the only real choice," said Baker in November 2017.

Bob Soang, general manager of Drakes Supermarkets, speaks for a growing number of independents in seeking to take advantage of the long-term benefits of investing in natural refrigerant systems.

"To spend \$1 million, \$2 million, \$3 million on a fit-out or a refurbishment: if you're a single store operator or a small multi-store operator, that's a fairly serious risk that you're putting on your balance sheet," Soang told this magazine (see *'The big comeback,' Accelerate Australia & NZ, summer 2018*).

However, he argued that adopting natural refrigerants is, "an opportunity to be, a) investing money in refurbishments, and b) to be doing them properly, because you benefit down the track".

"The technology is actually modern and likely to carry you through much longer than that cheap and nasty, low-cost budget quick fix," Soang added.

The independent retail community is tightly knit and word spreads quickly. Often retailers deciding whether to invest in new HVAC&R equipment will readily consult with other retailers in the community.

This word-of-mouth effect is making itself felt in the decision-making processes of such business owners, and observers such as AJ Baker believe its impact is growing.

"End users understand, and they talk amongst each other," Baker told *Accelerate* at AIRAH's Refrigeration 2018 conference, commenting on increased awareness of natural refrigerants in Australia.

"The more that people talk, the more other new users will understand that they need to change their systems to CO₂ as well, allowing us to help them future-proof their stores," he added.

Increased use of CO₂ technology in Australia's food retail industry acts as a signal of how the discussion is shifting among such businesses, according to Dave Redden, principal at Refrigeration Innovations, a consultancy.

He observes the conversation around replacing equipment moving on to longer-term considerations as a wider spectrum of industry players are made aware of the long-term costs of choosing synthetic refrigerants – and the advantages of natural refrigerants in protecting against those costs.

"The questions are now reversed," said Redden at AIRAH's Refrigeration 2019 conference. "The first question is, what are the long-term costs of the equipment we're choosing to run, and the second question is, what are the upfront costs?"

Natural refrigerant-based commercial refrigeration options, then, have certainly been making inroads into the Australian market – a trend that looks set to continue.





“ We can now focus far more on running our business as opposed to worrying about efficiency or replacing equipment and changing refrigerants. ”

– Petar Lujic, owner, IGA Market Central

NatRefs poised to grow in industrial sector

Yet commercial refrigeration is not the only promising growth area. Natural refrigerants also look well placed to make greater inroads into the industrial sector, having put down strong roots.

Ammonia's superior performance as a heat transfer substance, compared to synthetic refrigerants, for use in large industrial-scale refrigeration plants is well known. According to the International Institute of Ammonia Refrigeration (IIAR), it was first used as a refrigerant in the 1850s, in France.

Yet as demand for industrial refrigeration grew, so did the amount of ammonia used in refrigeration systems. Nowadays, efforts are underway to reduce the charge of ammonia used in HVAC&R systems. CO₂ transcritical, meanwhile, is also beginning to penetrate the industrial sector.

The low-charge trend is attracting new customers to ammonia, while new technology is bringing CO₂ to higher capacities.

Smaller amounts of ammonia are now being used without compromising on energy efficiency. In October 2018, for example, Scantec Refrigeration Technologies commissioned a central-type, two-stage and low-charge ammonia system in Mackay, North Queensland.

The ammonia plant serves a cold storage and food service distribution facility and is notably, "the smallest low-charge central system designed and constructed by Scantec so far," according to the firm's managing director, Stefan Jensen.

Jensen predicts that ammonia will increasingly be used in smaller-capacity applications as innovation helps to bring the refrigerant charge down still further.

The system's low- and medium-temperature design capacities are both approximately 50 kW respectively, with a total ammonia charge of some 500 kg.

Competition between natural refrigerants in this area is growing, according to Jensen. "The capacity range is well and truly within the area previously reserved for HFC-based solutions and is now occupied by a large number of transcritical CO₂ solution providers," he says.

The Mackay installation replaced an R404A system that was over a decade old, "comprising multiple air-cooled, single compression stage, multiplexed condensing units, and electric defrost," Jensen says.

The Scantec managing director believes this to be "the first 'real' HFC-based system being replaced with a small-scale, low-charge NH₃ system in Australia – and possibly anywhere".

In November 2017, Danish system manufacturer Advansor's first transcritical CO₂ rack in Australia was commissioned at a United Food Express cold storage warehouse in Melbourne (see '[Up and running](#)', *Accelerate Australia & NZ*, summer 2018 edition).

The Natural Refrigerants Company, which represents Advansor in Australia, sees more opportunities for large-scale installations of transcritical CO₂ systems in the country.

"Due to the 'semi-industrial, semi-commercial' nature of CO₂ systems, they come at a reduced initial cost compared to equivalent NH₃ systems," says Jonathon Hare, a refrigeration engineer at the Natural Refrigerants Company.

"Although [...] a standard, air-cooled, parallel compression CO₂ system uses more energy than the equivalent evaporatively condensed NH₃ system," Hare argues, "the lifecycle costs are much the same, if not less for the CO₂ system" by virtue of the lower initial investment cost.

Large amounts of high-temperature heat can also be reclaimed from CO₂ systems for use by the end user in industrial processes, he points out.

History shows that a lack of government support and environmental policy leadership has done little to help end users, contractors and suppliers to introduce environmentally friendly natural-refrigerant technologies in Australia's HVAC&R sector.

The onus, therefore, has typically been on innovative individuals and companies with an interest in the industry's future to shoulder a degree of commercial risk in pursuit of a long-term payoff.

Ian Wilson, project engineer and co-owner of Strathbrook Industrial Services, is doing just that. One of his favourite projects was for F. Mayer Imports Pty Ltd., a food importer and wholesaler. Strathbrook installed a transcritical CO₂ plant with an ammonia chiller at the firm's Melbourne distribution warehouse (see '[F. Mayer reaping rewards of innovation](#)', *Accelerate Australia & NZ*, summer 2017).

Moving forward, naturally

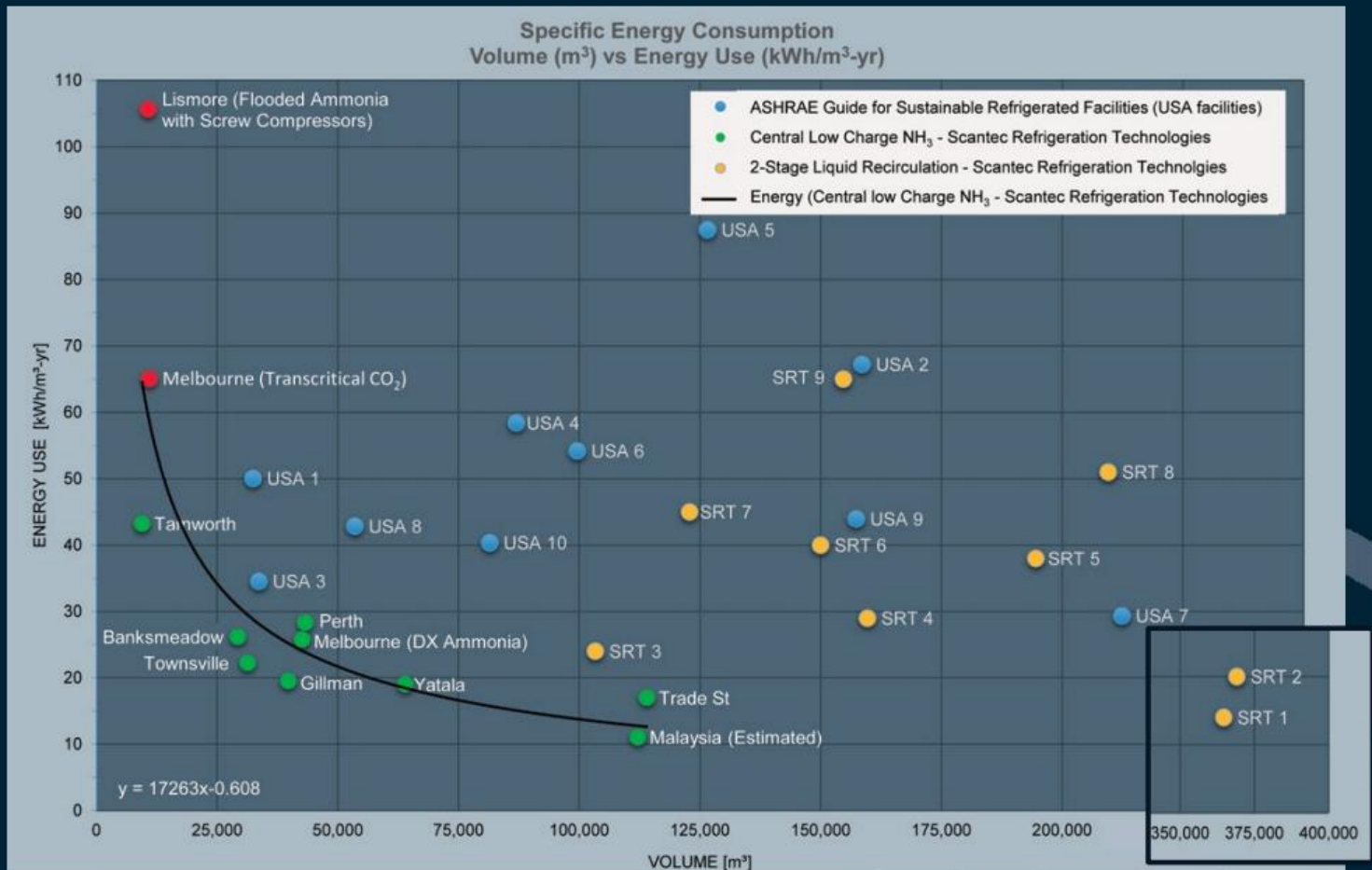
While long-serving HVAC&R professionals have seen different generations of synthetic refrigerant come and go over the years, the story of natural refrigerants in Australia has progressed rapidly.

Since the first *Accelerate Australia & NZ* was published in autumn 2016, there is little doubt that natural refrigerant technologies have become more readily available in Australia and that awareness of their benefits has increased. With so many end users adopting them, the market will surely continue to grow.

■ AW & DY

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References:

- Douglas T.Reindl, Todd B.Jekel, Industrial Refrigeration Consortium, March 2010. Industrial Refrigeration Energy Efficiency Guidebook, University of Wisconsin- Madison
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Texas retailer turns to propane

Texas grocery chain H-E-B reports on the performance of its pioneering outlet in the warm climate of Austin, which uses only propane condensing units for all display cases. *Accelerate America* reports.

— By Charlotte McLaughlin & Michael Garry

In July 2013, San Antonio, Texas-based grocery powerhouse H.E. Butt Grocery Company (H-E-B) opened a store in Austin, Texas, that is regarded as the first U.S. supermarket to employ propane-refrigerated display cases throughout the store.

As propane (R290) increasingly becomes a viable refrigeration option for new and existing stores in North America, many retailers and their suppliers have become understandably curious about how this initial R290 supermarket has fared over the past six years. (See *'R290: The future of retail refrigeration?'*, *Accelerate America*, January 2019.)

To shed light on that subject, the U.S. Environmental Protection Agency's (EPA) GreenChill program hosted a webinar on February 12 featuring Charlie Wernette, principal engineer at H-E-B, and Richard Gilles, senior product leader, distributed solutions for Hussmann, the supplier of H-E-B's R290 cases.

The R290 pilot was an opportunity for H-E-B, which runs 400 stores in Texas and Mexico, to test a natural refrigerant in the warm temperatures where it operates, Wernette said.

"We were really going after as much from the sustainability standpoint as we could," he said. Meanwhile, in 2019, the system continues to "kick right along".

One of H-E-B's biggest takeaways from the R290 store is that it has experienced zero leaks to date – practically unheard of for stores of this size. That's even with 346 R290 condensing units in the store (each containing no more than 150g of propane charge, the maximum allowed) as well as packaged condensing units (with an evaporator) in the walk-in rooms.

Each of the packaged units has 350g of R290, based on permission from the EPA. Keeping to the 150g limit in the walk-ins would have required too many condensing units, Wernette noted.

Supermarkets in the recent past have typically leaked around 25% of their large-charge (3,000 lbs. and over; 1,361 kg) DX systems containing high-GWP refrigerant, though the GreenChill program has helped bring that average down.

“In my mind it is a huge success that we can put a commercial refrigeration system in a supermarket and not have it leak.”

— Charlie Wernette, H-E-B

“In my mind it is a huge success that we can put a commercial refrigeration system in a supermarket and not have it leak,” Wernette said. “H-E-B actually predicted a zero leak rate going into the project,” he added.

Hussmann’s new R290 MicroDS line consists of factory-made, pre-charged, hermetically sealed plug-in systems that have a leak rate of under 1% and a refrigerant charge that is 95-98% lower than a conventional DX system, Gilles said.

But another prediction – that the system would save 40-50% in energy consumption – did not prove true. “The energy savings are really on par with other stores,” Wernette said, adding that he had been “chasing energy in a big, big way here”.

Wernette pointed to energy usage by pumps in three glycol loops that remove heat from the condensing units as the reason for missing the energy targets. “It was a lot more than we assumed,” he said.

On the other hand, the store saved energy by putting doors or lids on about 95% of all the display cases, Wernette said. The doors were not found to cause any loss of sales. “Fresh meat has doors and people still shop it,” he said.

Overall maintenance costs at the store were higher than expected due to compressor failures. “We haven’t been able to put our finger on why, but keep in mind there are over 360 compressors just for refrigeration in this store,” he said.

Hussmann and H-E-B have worked to determine the cause of the compressor failures. In its new line of microDS R290 equipment, Hussmann has included a number of changes aimed at correcting this issue and improving efficiency, including phase monitoring, a high-pressure cut-out switch, and a high-temperature cut-out for the discharge line, said Gilles.

The capital cost of the H-E-B system was comparable to that of a transcritical CO₂ system, said Gilles. (A transcritical system typically costs more than a conventional system.) However, the simplicity of the R290 system reduces installation costs, he noted.

Also for HVAC

Located above the reach-in cases and inside the coffin cases, the H-E-B store's condensing units consist of not only a compressor and condenser but also an evaporator.

The store leverages the heat of rejection (1,319,806 BTUs) captured by the glycol loop to also deliver cooling for air conditioning and heating for the store via a "temperature stairway," said Wernette.

Initially, the 400-TR (1,407 kg) HFC chiller (with a cooling tower) brings down the temperature of the glycol to 45°F (7.2°C) and sends it to the cases. (The new MicroDS line uses HFC-free fluid coolers; see *'Husmann debuts self-contained propane cases,' Accelerate America*, November-December 2018.)

The glycol emerges from the cases at 55°F (12.8°C), and is used in the packaged HVAC equipment on the roof. Its temperature now 65°F (18.3°C), the glycol goes through a radiant slab for cooling and heating in the store.

Combining the air conditioning and heating with the refrigeration system and also using LED lights helped earn the store Gold LEED (Leadership in Energy and Environmental Design) certification.

Wernette acknowledged that the 150g charge limitation drives up the number of condensing units and the cost of the overall system. Assuming the International Electrotechnical Commission votes to increase the charge limit to 500g for A3 (flammable) refrigerants in commercial refrigeration (see *'New HC charge limit nears final IEC vote,' Accelerate America*, November-December 2018), the standard would still need to be adopted in the U.S. by bodies such as UL and ASHRAE, and by the EPA.

"If we could ever do [this] one thing as a country, it would really help a lot to get the number of compressors down," Wernette noted.

According to Gilles, a 500g charge would reduce the number of compressors by "one-half, if not two-thirds".

Wernette also offered caveats for dealing with an R290 line-up, such as checking the equipment regularly. "You need to ensure that the glycol supply is really, really clean," he said. "Small particles will plug up the braze plate heat exchangers."

He also advised other R290 users to make sure that the controls shut down the condensing units upon the loss of the chiller. Early on, when the H-E-B store lost its chiller in a thunderstorm, the condensing units didn't shut down, a glycol line blew out, and water was dispersed throughout the store.

In addition, he recommended checking the water chemistry of the closed glycol loops, which changes when new water is added.

Despite some of the challenges he faced, Wernette left the webinar audience with a number of positive statements about R290. "R290 is a safe and reliable refrigerant when installed properly," he said. "I can't say enough good things about that. It's amazing that 150g of it can do what it does from the refrigeration standpoint."

Will H-E-B use R290 in future stores? "We think it's a viable technology, as well as other technologies," he said. "We're looking at everything." ■ CM & MG

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THE SPIRIT OF CO₂

A Q-ton air-to-water heat pump based on natural refrigerant CO₂ is delivering energy savings at an award-winning distillery in Tasmania.

— By Andrew Williams

In a quiet corner of southeast Tasmania, the centuries-old Shene Estate and Distillery – housed in the riverside community of Pontville, near Hobart – is turning to cutting-edge natural refrigerant-based technology to help streamline production.

The distillery has been using locally sourced ingredients and traditional methods to produce gin and single malt whiskey for 199 years. In 2017, Shene Estate's Poltergeist Gin was awarded a Double Gold medal at the San Francisco World Spirits Competition and a Gold medal at the World Gin Awards.

With such recognition comes growth. Every day, the distillery needs some 6,000 litres of hot water at 90°C to heat the barley mash used in production.

"Given the distillery's growing production output, these traditional methods have resulted in a huge amount of water used each day," says Trent Miller, hot water heat pump sales executive for Mitsubishi Heavy Industries Air-Conditioners Australia Pty. Ltd. (MHIAA).

Considering the distillery's daily water volume and temperature requirements, as well as the colder temperatures experienced at the distillery in winter,





ABOVE

Shene Estate's award-winning Poltergeist gin.

LEFT

Shene Estate

"it was agreed that Mitsubishi Heavy Industries' Q-ton, CO₂ air-to-water hot water solution would be perfect for the application," Miller says.

From its high point of 90°C, the water is later cooled to between 64°C and 65°C, the optimum temperature to dissolve sugars contained within the starch of malted barley. At the end of the process, the temperature is increased to 70°C to dissolve enzymes within the mash.

"Conventionally, the water used in the above processes is heated using an instantaneous electric hot water heater," Miller explains. Amid ever increasing electricity prices in Australia, "this was becoming expensive and unsustainable" for the distillery, he says.

Gas was not a viable alternative option because the Shene Estate is not connected to the gas grid. MHIAA's Q-ton fitted the bill as an alternative and more energy-efficient hot water solution that could operate in the area's low outdoor temperatures.

The Q-ton heat pump works by drawing heat through an evaporator containing natural refrigerant CO₂, which absorbs the heat in the air. The two-stage compressor compresses the refrigerant under high pressure to raise its temperature, while a heat exchanger uses heat from the refrigerant to generate hot water, which is then stored in tanks.

"The Q-ton can deliver great performance at low outdoor temperatures down to -25°C, making it perfect for the colder climates of Tasmania," Miller says. "It delivers accurate, set point heated water, all year round."

Cost savings

The new installation was completed in July 2017. The distillery's previous water heater had only achieved a coefficient of performance (COP) of one, delivering 48 kW output from

48 kW input. Because the Q-ton is more efficient, "it is much cheaper to run, delivering huge reductions in running costs," Miller says.

Thanks to the Q-ton, the distillery should save 60% per year on its energy bills compared to an instantaneous heater, according to MHIAA. "The Q-ton's remote-control scheduling function allows it to produce hot water during off-peak electricity periods and store this in tanks for later use, offering even further cost savings," Miller says.

MHIAA calculates that the Q-ton consumes 76% less energy than an electric line heater and 46% less energy than a gas boiler. It also produces 74% less CO₂ emissions than an electric heater and 48% less than a gas boiler.

"By working closely with the owners of the Shene Estate, MHIAA was able to deliver a reliable hot water solution that will significantly reduce the operation's energy costs and deliver reliable hot water – even throughout Tasmania's chilly winters," says Miller.

AW

Fresh perspectives at a refreshed ATMO Australia

The ATMOsphere Australia conference on natural refrigerants, now in its fourth edition, is returning to Melbourne on 8-9 May 2019 with a refreshed conference programme and several first-time speakers.

— By Eda Isaksson

ATMOsphere Australia, the Australia and New Zealand edition of the global conference series on natural refrigerants – organised by *Accelerate* publisher shecco – is returning to Melbourne. ATMOsphere Australia was launched there four years ago to promote energy-efficient HVAC&R practices in Australia and New Zealand and to showcase the next generation of natural refrigerant-based technology.

The conference will once more serve as a meeting place for local and international HVAC&R stakeholders representing different interest groups including end users, contractors, manufacturers, academia, NGOs and government. They will gather to discuss the business case for natural refrigerants by disseminating knowledge, sharing lessons learned and exchanging best practices.

The 2019 edition is the most ambitious to date, with a refreshed programme structure focusing on panel discussions and the importance of contractors, whose role is highlighted in a dedicated session.

A GROWING MARKET

Environmentally friendly and energy-efficient technologies are becoming increasingly popular in Australia and New Zealand, as they are globally. This has strengthened the business case for natural refrigerants over the past few years, broadening the spectrum of topics to be covered at ATMOsphere Australia in 2019.

Accordingly, this year's conference has been extended to one-and-a-half days to feature more presentations and panel discussions, as well as more networking opportunities.

The conference boasts over 30 expert speakers, most of whom are presenting at the event for the first time. Over half represent end-user and contractor companies.

The End User Panel, one of the most highly anticipated conference sessions, will see Nestlé, Woolworths, Aldi, Ritchies Supermarkets, Emergent Cold and Link Logistics take to the stage. These end users will offer their valuable perspectives on the benefits, challenges and future potential for natural refrigerant-based technologies.

These issues will be covered from the contractor's perspective during the conference's dedicated contractors panel, which kicks off with a keynote presentation by Baker Refrigeration, followed by presentations from MB Refrigeration, Coolphase, Degree C and Air Engineers, and a panel discussion.

POLICY & ENERGY

In the Policy and Energy Panel, industry and government experts will discuss Australian, New Zealand and global policy and regulatory issues. They will also consider the HVAC&R sector's impact on climate change. The session gets off to a thought-provoking start, covering the Kigali Amendment to the Montreal Protocol, the transition to zero-net emissions systems, and sustainability in integrated solutions.

Peter Brodribb of expert group Cold Hard Facts will give an overview of the RAC industry in Australia based on a revision of the Cold Hard Facts 3 study, predicting how it will develop in the future.

Scott Hamilton of the Australian-German Energy Transition Hub & H4CO will speak about renewable energy and sustainability in relation to the refrigeration and cooling sectors.

Iain Stewart of Climate Works will explain how to tackle future decarbonisation in the industry.

Jonathan Jutsen of the Australian Alliance for Energy Productivity (A2EP) will share information on catalysing transformative change in energy productivity with reference to cold chain and heat pump projects.

Michael Bellstedt of Minus 40 (on behalf of Sustainability VIC) will talk about a free 'Refrigeration Efficiency Masterclass' delivered last year to businesses across Victoria, and other 2019 initiatives.

Derek Harbison of Smart Consult will share his knowledge about hydrocarbons and his experiences overseas.

LOOKING TO THE FUTURE: VIRTUAL REALITY TRAINING

TAFE SA, a vocational education and training school in South Australia, offers virtual reality (VR) refrigerant safety training where air-conditioning and refrigeration students are taught how to identify workplace hazards in real-world settings, without needing to step into a real machinery room.

Shannon Baldock, a lecturer at TAFE SA, will hold a live demonstration of VR training for natural refrigerants on day one of the conference. The audience will see a virtual classroom on the conference screen.

SCANTEC SHOWING MARKET LEADERSHIP

Scantec Refrigeration Technologies Pty Ltd., an Australia-based industrial refrigeration and environment control solutions provider, is one of the market leaders in the Asia-Pacific region. It is supporting ATMOsphere Australia as Platinum Sponsor to demonstrate the company's dedication to natural refrigerant-based technologies.

Seeing growing market potential in the sector, Stefan Jensen, managing director of Scantec, said, "the current debate about the HFC phasedown is not about refrigerant substitution, it's about the technology transition that the phasedown will trigger, and the fact that this transition has only just started – and only in selected jurisdictions globally".

The company also takes pride in helping customers to convert existing HFC-based systems to natural refrigerants. "For end users, the real challenge is not [necessarily] the cost of the refrigerant transition. The real challenge is maximising the benefits of the capital cost of the refrigerant change that ultimately becomes a necessity for all anyway," said Jensen.

Jensen will explain how retrofitted or new plants can pay for themselves in 3-6 years based on energy savings alone. "We're hoping that the general thread through ATMO Australia 2019 will enable end users to walk away with a simple set of facts that can assist their decision-making," he said. ■ EI

08-09/05/2019
MELBOURNE

PROGRAMME

WEDNESDAY 8 MAY 2019

10:00 REGISTRATION & WELCOME COFFEE

10:30 WELCOME & INTRODUCTION

shecco

11:00 POLICY & ENERGY PANEL DISCUSSION

Expert Group, ClimateWorks, Australian-German Energy Transition Hub, Australian Alliance for Energy Productivity (A2EP), Minus 40 (on behalf of Sustainability VIC), Smart Consult

12:20 SNEAK PEEK AT THE FUTURE

TAFE SA virtual reality training for natural refrigerants demo

12:30 ATMO CONNECT LUNCH

Networking lunch

14:00 CONTRACTORS PANEL

Baker Refrigeration, MB Refrigeration, Coolphase, Degree C, Air Engineers

15:30 NETWORKING BREAK

16:00 TECHNOLOGY ROUND TABLE - INDUSTRIAL REFRIGERATION

Scantec, Mayekawa, KAV Consulting, Tri Tech Refrigeration Australia, Gordon Brothers, TEK0, Automatic Heating

17:30 ATMO CONNECT NETWORKING DRINKS RECEPTION

Networking drinks

19:00 GALA DINNER

THURSDAY 9 MAY 2019

08:30 NETWORKING BREAKFAST

09:00 END USER PANEL

Nestlé, Emergent Cold, Ritchies Supermarkets, Aldi, Link Logistics, Woolworths

10:30 NETWORKING BREAK

Networking lunch

11:00 TECHNOLOGY ROUND TABLE - COMMERCIAL APPLICATIONS

Embraco, Mitsubishi Heavy Industries Air Conditioners Australia, Emerson Climate Technologies, Refrigeration Innovations, Scantec, Panasonic

12:30 ATMO CONNECT LUNCH

13:30 FRIDGIES OF THE FUTURE

TAFE SA, Beijer Ref Australia, TAFE NSW, Australian Refrigeration Council (ARC), Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH), Australian Refrigeration Association (ARA)

14:45 CONCLUSIONS

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Lidl France banking on propane

In August 2018, Lidl France opened its first supermarket to use propane, a hydrocarbon, for 100% of its cooling needs. Since then and from now on, all the retailer's new stores use this natural refrigerant.

— By Andrew Williams



Operating some 1,500 stores throughout France, Lidl France is acutely aware of the responsibility it shares to help put the world on a more environmentally sustainable footing. Active for almost 25 years, the retailer employs some 35,000 people nationwide.

HVAC&R represents a significant proportion of any food retailer's carbon footprint. In 2010, Europe's commercial refrigeration sector represented 40% of refrigerant greenhouse gas consumption, 85% of which was attributed to large refrigeration systems in supermarkets (which primarily used R404A), [according to a 2012 study](#) conducted for EPEE by UK-based environmental consultants SKM Enviros.

"This implies that supermarkets are the largest consumers of HFCs in Europe, with a share of about one third," the SKM Enviros study says.

According to [a 2016 report](#) produced by Swedish research institute KTH for the EU-funded SuperSmart project, 18-30% of annual equivalent carbon emissions in European supermarkets are attributed to their choice of refrigerants (data: *Carr-Shand et al.*, 2009).

Against this background, Lidl France decided to act. In August 2018, for example, Lidl Valenton in the Paris region (Créteil) became the first Lidl France store to use propane for 100% of its cooling needs. "Since then and from now on, our strategy is for all new stores to be 100% propane-based," Nabil Rehab, project manager – refrigeration systems, Lidl France, told *Accelerate Europe*.

By the end of the fiscal year 2018 (which ended in February 2019), Lidl France had converted the cooling furniture to propane in 40 stores.

"This fiscal year, we'll convert an additional 10% of our stores, pursue a programme of 'store transfer', and

open new stores using propane," Yassine Rami, head of department (purchasing and store investments) at Lidl France, told *Accelerate Europe*.

"In total, we'll have 250 propane stores by the end of this fiscal year," Rami explains.

The retailer intends to change the cooling furniture in around 100 stores per year. "In a few stores we'll do retrofits, because they're using R404A," Rehab explains.

Lidl France is part of Lidl Stiftung & Co. KG, founded in 1930 by Joseph Schwarz and headquartered in Neckarsulm, Germany.

The parent company operates over 10,000 stores across 28 European countries and the United States. Its chairman and CEO is Dieter Schwarz, who also holds the same positions in hypermarket chain Kaufland.

Lidl first used propane in 2016, when it tested a propane system in



Lidl France is targeting 250 propane stores by the end of this fiscal year.

a supermarket in Munich, Germany. Having initially also considered CO₂, another natural refrigerant, propane ultimately won the day.

What motivated Lidl France to follow suit and adopt propane too? Propane doesn't just reduce Lidl France's greenhouse gas emissions – it also delivers energy savings, Rehab says.

Moreover, installing plug-in and remote semi plug-in cabinets avoids the need for a centralised refrigeration plant. "Propane in itself is a very efficient refrigerant. What we're doing is decentralising production," Rehab explains.

A future-proof choice

The retailer is also acting out of concern for the climate. "The impact of HFCs on the environment today is significant. They make a major contribution to the greenhouse effect, and that's why climate science requires them to be phased down," Rami says.

"We want to stay one step ahead of that curve, while at the same time reducing our impact on the environment," he says.

Lidl France estimates that the cost of HFCs has increased four times over in recent years. "Part of the reason for this is that they're brutally overtaxed," says Rehab. "By choosing propane, we're anticipating such issues and staying one step ahead of such problems."

By 2022, Lidl France expects around 50% of its 1,500-strong store portfolio to be equipped with propane-based cooling equipment. "The move to propane was not primarily driven by economic considerations. It was environmental," Rehab says.

Lidl France's propane journey began within the company itself. "What Lidl France has done is rare – it organises regular meetings between the *frigoristes* (refrigeration technicians), the technology providers, and Lidl France itself," says Sylvain Gilliaux,

managing director (France) at Hauser, an Austrian OEM and cooling furniture maker that provides Lidl France with cabinets.

"Lidl France plays a kind of 'gentleman organiser' role to ensure that everyone is aligned, and to make their vision concrete," Gilliaux says.

Making the business case

Lidl France's commitment to natural refrigerants extends to cold storage, where it uses either CO₂ or ammonia in all new warehouses. "The objective is to no longer use HFCs – they're polluting, there's going to be less and less of them (meaning that availability is an issue), and they're really expensive," Rami says.

The positive environmental impact of choosing natural refrigerants is clear. But some HVAC&R practitioners believe more could be done to demonstrate their economic advantages to customers.



Propane cases in Lidl Valenton, the first Lidl France store to be 100% propane-based.

"The choice that Lidl has made for natural refrigerants – not just in refrigerated cabinets but also for frozen goods, for cold stores, and so on – is ideological," says Gillaux.

"Lidl has decided that it must use natural refrigerants, for environmental reasons," he says.

Gillaux thinks the onus is on manufacturers to communicate the business case for natural refrigerants more clearly. "Most retailers would expect to make huge energy savings, if they were to take the risk of changing to a new technology," he says.

Gillaux stresses the importance of training France's *frigoristes* to use natural refrigerant-based technologies. "This doesn't just take place in training institutes. Manufacturers such as us hold training sessions on new technologies," he says.

Regulation and safety concerns can represent obstacles to wider uptake of hydrocarbons, which are flammable substances.

International standard IEC 60335-2-89 currently limits the use of flammable refrigerants in hermetically sealed commercial refrigeration equipment with an incorporated or remote refrigerant unit or compressor to 150g.

To comply with the regulations, Lidl France uses three circuits per store. "Using three separate circuits of 150g gives us the capacity we need," says Lidl France's Rehab.

The 150g limit prevents refrigeration equipment manufacturers and users from fully exploiting the safe and efficient application of hydrocarbon refrigerants in the commercial refrigeration sector. The new limit on the table is 500g (see '[The home straight](#)', *Accelerate Europe*, winter 2018).

"Clearly, the furniture would be cheaper if the rules were adapted to allow up to 500g in a single circuit," Rehab says.

To strengthen the business case for natural refrigerants, he stresses the importance of looking at energy savings in a holistic manner.

600 of Lidl France's supermarkets already have cooling cabinets with doors, for example. "We hope to put doors on all our cabinets by 2022," Rehab says.

He argues that the environmental benefits of using propane, wedded to the efficiency benefits of other measures such as cabinet doors, air curtains and heat reclaim, is a powerful combination. "It's about improving the whole cold chain," he explains. ■ AW

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1/

Ajinomoto Frozen Foods to eliminate HCFCs by 2020, HFCs by 2030



2/

Ajinomoto Frozen Foods, a major Japan-based food manufacturer, has been installing natural refrigerant-based HVAC&R systems for nearly a decade. Aiming to completely phase out HCFC and HFC use from its entire business by 2030, the company is proud to help lead Japanese industry towards a more sustainable future. *Accelerate Japan* reports.

— By Devin Yoshimoto,
Rena Okabe & Tomoro Sato



Photography: Tomoro Sato

1/ Japanese 'gyoza' dumplings frozen in a spiral freezer powered by natural refrigerants NH_3 and CO_2 .

2/ Ajinomoto Frozen Foods food production line spiral freezing system.

Japan's ratification of the Kigali Amendment to the Protocol in December 2018 gave users of HVAC&R equipment there a clear policy signal to phase down the use of f-gases in their businesses – including HFCs.

Japanese food manufacturer Ajinomoto Frozen Foods Co., Ltd. has already made significant progress in this regard. It has been retrofitting its facilities with natural refrigerant systems for close to a decade now.

Headquartered in Tokyo, Ajinomoto Frozen Foods is a division of Japanese multinational Ajinomoto Co., Inc. – a food and amino science corporation best known for creating the original monosodium glutamate (MSG) product branded 'AJI-NO-MOTO'.

The company provides its products globally through the Ajinomoto Group, which makes, sells and conducts R&D into frozen food items in Japan as well as in Europe, Asia and North America.

In 2006, the company pledged to completely eliminate its use of R22 in freezer systems in its domestic food processing factories, replacing systems using this HCFC with natural refrigerant-based systems by 2020.

The move was motivated by increasingly strict regulations on the use of Freon that had been put in place in Japan since 2001, as well as the advent of global regulations such as the Montreal Protocol and its subsequent Kigali Amendment.

As of February 2019, the company had converted a total of 24 freezer units to natural refrigerant systems, with six left to be converted by 2020.

The company is striving to eliminate the use of HCFCs by 2020 and HFCs by 2030 from all of its domestic frozen and cold storage warehouses.

During a recent tour of one of the company's frozen food processing facilities, Ajinomoto Frozen Foods' Executive Officer Tomomitsu Yamasaki spoke to *Accelerate Japan* about the role that natural refrigerants play in the firm's sustainability initiatives.

At its food processing facility in Gunma, the company uses NH_3/CO_2 secondary brine refrigeration systems, provided by Japan-based OEM Mayekawa, in the product freezing process for several food items it sells, including the Japanese dumplings commonly referred to as 'gyoza'.

Asked about the company's motivation to transition to natural refrigerants, Yamasaki explains that, "by introducing natural refrigerant-based equipment, we have achieved a certain amount of energy efficiency".

"However, we won't stop taking action until we have completely eliminated our use of Freon," he adds.

Government policy has a role to play here. "The production and consumption of HCFCs in Japan will officially be prohibited in 2020," Yamasaki says.

"I feel that the general attitude within the industry is that 'it will be fine even if we do not switch to natural refrigerant equipment just yet'," he says.

"However, if there is a refrigerant leak, our plant would stop operating and we would cease to function as a frozen food company. So, in order to avoid such risks and to sustain ourselves as a company, we are aiming to completely eliminate our use of Freon."

Several of Ajinomoto Frozen Foods' natural refrigerant system installations were supported with subsidies provided by the Japanese Ministry of Environment.

These subsidies are awarded specifically to natural refrigerant system installations in the food retail, food manufacturing and cold storage industries.

The budget for the 2018 financial year (FY2018) was ¥6.4 billion (€47 million). In December, the Japanese Ministry of Environment confirmed that a budget of ¥7.4 billion (€58 million) had been set for financial year 2019.

These subsidies, Yamasaki explains, are especially important for end users in the food manufacturing and cold storage industries, which often see initial costs as the biggest barrier to natural refrigerant adoption.

"In our industry, the profit margins are never high and it is the same even for major companies," says Yamasaki.

"Product prices are low and there are operational costs," he continues. "When adopting natural refrigerant equipment, the initial costs are currently 20-30% higher than existing Freon-based systems. For the frozen food industry, which has many small and medium-sized enterprises, not much progress can be made due to these financial concerns."



Yamasaki, however, remains committed to the company's Freon elimination goal.

"It is our single mission to work on the complete elimination of our use of Freon. Although for the past 2-3 years we've not been able to replace as much as we expected, we're determined to continue. We've made progress with establishing our replacement process and we plan on proceeding with replacing the rest of the equipment at our remaining facilities," he says.

In addition to food processing freezers, Ajinomoto Frozen Foods also operates its own frozen and cold storage warehouses, which it has included in its Freon phase-out plan.

The company aims to replace a total of 75 refrigeration systems at all its cold storage warehouses, instead adopting natural refrigerants or refrigerants with a GWP value of less than 150 by 2030.

To date, it has already installed and begun testing transcritical CO₂ systems

from Japanese manufacturers Nihon Netsugen Systems (NNS) and Mitsubishi Heavy Industries Thermal Systems Co. Ltd. (MHI) at two of its cold storage facilities in Japan.

Overseas, the company operates cold storage and food processing facilities in Thailand, China and Poland. The company aims to eliminate the use of HCFCs by 2020 and HFCs by 2030 at these facilities as well.

Ajinomoto Frozen Foods, Yamasaki explains, is also keen to spread the word about the benefits of natural refrigerants to the wider world.

"I hope to communicate beyond the industry's borders about our company's future environmental sustainability efforts," says Yamasaki.

"Both our environment and way of life are continuing to be threatened by global warming, as evidenced by the recent increase in natural disasters and various environmental problems," he says.

ABOVE

The Ajinomoto Frozen Foods management team in front of Mayekawa's NH₃/CO₂ refrigeration systems at a factory in Gunma, Japan.

"While manufacturers are continuing to pursue technological development, we also need end user companies to fulfil their responsibilities to shift towards using renewable energy and natural refrigerants as effective measures to prevent global warming," he argues.

The Ajinomoto Group is committed to making improvements in response to the environmental problems facing the world. "We intend to lead this industry in this respect," Yamasaki declares.

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Campbell's natural refrigerant soup

A close-up portrait of Bing Cheng, a middle-aged man with dark hair, smiling slightly. He is wearing a dark jacket. The background is blurred, showing what appears to be a market or street scene with red lanterns.

Bing Cheng,
Campbell Soup
Company

The food and beverage giant, which pioneered low-charge ammonia systems, has added cascade and transcritical CO₂ technology to the mix. *Accelerate America* reports.

— By Michael Garry

Like many consumer packaged goods firms, Campbell Soup Company offers numerous versions of its products, including dozens of soups and countless cookie options.

That penchant for diversity has now extended into natural refrigerants. A pioneer of low-charge industrial ammonia systems, Campbell over the past year has added two new refrigeration flavors – CO₂ cascade and transcritical CO₂.

In doing so, Campbell has joined a small but growing group of industrial end users in the United States who are installing transcritical and cascade CO₂ systems to improve safety and avoid regulations in what has for decades been an ammonia-centric industry.

The CO₂ cascade installations, incorporating ammonia (NH₃) and glycol, have taken place at two of Campbell's Pepperidge Farm bakeries – a replacement system in Lakeland, Fla., and a new system in Downingtown, Pa. (incorporating an unusual spiral freezer). Another replacement system is planned this year at a bakery in Denver, Pa.

The CO₂ cascade solutions have so far "worked out well for us," said Bing Cheng, Campbell's senior manager of utilities, environmental and sustainability programs.

In addition, at its headquarters in Camden, N.J., Campbell has deployed its first CO₂-only transcritical system for a new ingredient cooler/freezer.

The CO₂ cascade systems use ammonia as the primary refrigerant, which in turn chills a glycol solution; the glycol, serving as an intermediary, chills CO₂. The CO₂ is then delivered to the evaporators' serving freezer loads.

By incorporating glycol in its CO₂ cascade freezer systems, Campbell is leveraging the glycol already being used as a result of an earlier decision to replace ozone layer-depleting R22 systems at five of its Pepperidge Farm plants (Downingtown, Lakeland and Denver, as well as plants in Richmond, Utah, and Willard, Ohio) with low-charge ammonia systems. (See *'Campbell's Low-Charge Recipe,' Accelerate America*, April 2016.)

The bakeries – which produce such iconic brands as Milano Cookies and Goldfish

“Campbell's operating guidance is to remove HFCs whenever possible.”

– Steve Parra, Campbell Soup Company

crackers – are now more than 90% R22-free, said Cheng, who has overseen the transition from R22 to natural refrigerants at Pepperidge Farm.

Campbell has deviated from using a direct ammonia/CO₂ cascade system (with no intermediary), an option increasingly utilized by industrial companies such as US Cold Storage and Mexican storage provider Frialisa. But in so doing, the soup company avoids having to deal with the possibility that ammonia and CO₂ would accidentally mix in the heat exchanger, producing system-clogging ammonium carbamate.

With its new CO₂ ventures, Campbell is adding another chapter to its pioneering career as a natural refrigerant innovator. That started in the early 1990s, when former longtime head of refrigeration Bob Czarnecki introduced one of the industry's first low-charge ammonia designs, followed in the late 1990s with low-charge packaged ammonia units. Most of Campbell's thermal plants (which make soup, sauces, beverages and other products) emphasize low-charge ammonia chiller packages that circulate glycol.

Starting in Lakeland

Campbell's first CO₂ cascade project took place in 2017 at the Pepperidge Farm facility in Lakeland, Fla., as it underwent its conversion from R22, which was replaced by ammonia/glycol for HVAC and chilled water applications. "CO₂ is better for low-temperature applications" than glycol, said Cheng.

The same approach will be followed in 2019 at the Denver plant, though the CO₂ rack (from Zero Zone) will be located on the roof rather than in an engine room. "The load at Denver was remote enough [from the engine room] to put the CO₂ skid out there," said Cheng.

The cascade systems at both Lakeland and Denver serve small ingredient freezers (7.2 TR/25.3 kg and 6 TR/21.1 kg, respectively), with CO₂ evaporators in the rooms.

Because of ammonia's greater efficiency, Campbell normally uses it for freezers, but "it would not make economic sense to put in a low-temperature ammonia compressor and penthouse ammonia evaporator for that small a load," said Steve Parra, a senior engineer for Campbell.

Campbell does employ a direct ammonia system with a penthouse evaporator in freezers at its thermal plants and at a Pepperidge Farm facility in Richmond, Utah. "We use a slight overfeed on the coil because we're trying to reduce the amount of ammonia," explained Parra. "We build them in a penthouse and elevate the coils enough to drain freely to the engine room."

Spiral CO₂ freezer

At its Downingtown, Pa.-based Pepperidge Farm frozen-food plant, Campbell installed a new 110-TR (387-kg) spiral production freezer (including evaporator coils) for bread products in January 2018. Cheng believes this is one of the first freezers in the U.S. bakery industry to use CO₂ in the freezing unit, said Cheng.

The CO₂ spiral freezer is connected to a CO₂ rack (from Hillphoenix), which is in turn linked to an existing ammonia/glycol system to create the cascade system. "There was extra glycol capacity that we tapped into for the CO₂," said Cheng.

Utilizing already existing ammonia/glycol equipment at the Downingtown plant again made the cascade system "a very low-cost option" compared to adding a penthouse ammonia evaporator, Cheng noted. For the Pepperidge Farm freezers, "we could



Campbell Soup headquarters, Camden, N.J.

have used penthouse ammonia or HFCs, but we thought [cascade CO₂] was the best balance between natural refrigerants and cost”.

Parra said he was pleased thus far with the performance of the CO₂ cascade system. “We would use it again,” he said. “It’s a perfect fit for smaller loads where we don’t have low-temperature ammonia system.”

After start-up, Campbell has not experienced CO₂ leaks in the cascade system, noted Parra. The efficiency of the cascade system takes a “little hit” compared to a direct ammonia system, noted Parra, but he did not consider it significant for “relatively small loads”.

At its Pepperidge Farm facilities in Richmond, Utah, and Willard, Ohio, Campbell has transitioned to ammonia/glycol but has not yet installed CO₂.

First transcritical system

In Camden, N.J., at its world headquarters, Campbell installed its first transcritical CO₂ system (from Hillphoenix) in the first quarter of 2018 for a new 30-TR (105 kW) soup-ingredient cooler/freezer.

Campbell does not use ammonia in New Jersey due to the onerous regulations the state places on industrial users of the gas, said Parra, adding that the company does not want to use ammonia at its headquarters in any event.

In terms of efficiency, the transcritical system offers the advantage of using a single refrigerant and not having to pump secondary glycol or use heat exchangers between refrigerants, as in the cascade systems.

On the other hand, transcritical loses efficiency while operating in warmer ambient temperatures. Campbell did not choose to use an adiabatic condenser or other add-ons to improve efficiency.

As a company, Campbell said in its 2018 Corporate Responsibility Report that it believes the use of natural refrigerants “significantly improves energy efficiency, lowers energy costs and reduces greenhouse gas emissions”.

For Parra, transcritical was “the best way from an economic standpoint, both capital and installation. And it runs nice”.

Campbell has to date not used HFO blends. In general, Campbell’s operating guidance is “to remove HFCs whenever possible,” said Parra. ■ MG



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NatRefs: The Endgame at AIRAH 2019

New training opportunities, CO₂ technology developments, and penetration into the independent retail sector were among the natural refrigerant highlights at AIRAH's Refrigeration 2019 conference.

— By Devin Yoshimoto

Natural refrigerants are gaining ground as a focus of discussion in the Australian HVAC&R industry, with insiders noting a growing sense of collaboration among major industry bodies.

Accelerate Australia & NZ reports from AIRAH's Refrigeration 2019 conference in Melbourne, held on 25-26 March at Marvel Stadium.

Tony Gleeson, chief executive of AIRAH (the Australian Institute of Refrigeration, Air Conditioning and Heating), remarked that this year he had noticed, "a lot more sharing of ideas and more of a willingness to explore new ideas than before".

"There is an understanding that there are other options out there that people need to look at. I think people are becoming less insular, and more external looking," Gleeson said.

\$2M GRANT ISSUED FOR MOBILE TRAINING UNIT

Ian Tuena, president of the Australian Refrigeration Association (ARA), announced at the event that, "the Australian state of Victoria has issued a \$2 million grant for the design and construction of a mobile training module for refrigeration systems using ammonia, CO₂ and flammable refrigerants".

Tuena said the grant was the result of an effort led by industry associations ARA and the Australian Refrigeration Mechanics Association (ARMA), which originally pitched the mobile training idea.

The concept has already received endorsements from several other major industry associations such as AIRAH, the Australian Refrigeration Council (ARC), and leading end users such as Coles.

A lack of trained technicians is widely recognised as one of the biggest barriers to uptake of natural refrigerant-based technology in Australia.

"We hope it will eventually become a part of a national skills-based qualification which will underpin what we would like to see in the industry as a statutory licensing regime throughout the country," Tuena said.

The mobile training units are being designed locally, led by Jonathan Hare, refrigeration engineer for Australia-based contractor the Natural Refrigerants Company, which represents Advansor in the country.

Training is slated to begin in 2020.

CO₂ EFFICIENCY IN HIGH HEAT

Several keynote presentations discussed natural refrigerants on day one of the conference, highlighting an increased focus on technology at this year's event.

**LEFT**

Iain Campbell from the Rocky Mountain Institute (USA) addresses the audience during his keynote presentation on the Global Cooling Prize on conference day two.

BELOW

The contractors panel at the end of conference day one.

Photo credit: Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH).



Prof. Dr. Michael Kauffeld from the Karlsruhe University of Applied Sciences in Germany offered his personal views on the risk of continuing down the synthetic refrigerant path.

"It took 60 years (1930 to 1990) to find out that CFCs damage the ozone layer and 30 years (1990 to 2020) to acknowledge that HFCs contribute noticeably to global warming," his presentation stated.

"It will take 15 years to accept that HFOs are harmful to the local environment," Kauffeld said, citing effects on "fitters' health and terminal water bodies".

Jan Gerritsen, innovation manager (refrigeration solutions) at GEA Refrigeration, followed with his own keynote presentation analysing the differences between applying CO₂ versus ammonia in mid-sized industrial refrigeration systems.

The presentation focused on a study concerning an industrial refrigeration installation in Melbourne, Australia. The study showed how different factors such as incorporating heat recovery and freezing systems affected total cost of ownership and yearly energy consumption.

"Both CO₂ and ammonia have their advantages, depending on different situations & applications," Gerritsen said.

"In general, ammonia has better energy efficiency, while heat recovery over a big temperature difference is favourable for CO₂," he added.

Presentations from Dario Ferlin, Woolworths' sustainability engineer, and City Holdings Senior Refrigeration Engineer Brian Toulson highlighted their recent experiences with monitoring the performance of recent transcritical CO₂ system installations in high ambient temperatures.

"On 25 January, we had a significant heat event in Sydney," said Ferlin.

"We had seven consecutive days over 35°C – of which five days were over 40°C. The final day was our peak day, where we hit just over 46°C on the condenser deck."

The system, in a store in Prestons, New South Wales, was commissioned on 6 December 2018. It is the first transcritical CO₂ system to serve a Woolworths store's entire HVAC&R needs.

Ferlin presented temperature data for low-temperature, medium-temperature, and store ambient temperature versus outdoor ambient temperature for the period 25 January-1 February 2019.

"Now, just as a reminder, we are controlling three climate zones with this transcritical [CO₂] system. The low-temperature system, which is the freezers, the medium-temperature system, which is the chilled product, and the ambient store conditions," he said.

"We had satisfactory climate control conditions in all three climate zones throughout the seven-day heatwave," said Ferlin. The use of adiabatic cooling plays a key role in managing the system's energy use in extreme heat, he added.

"Adiabatics are fundamental to transcritical CO₂ if we are to make any inroads on abating energy consumption," said Ferlin.

The Woolworths engineer added, however, that the company is conscious of the fact that it does not intend to accept gains in energy efficiency in exchange for excessive water consumption.

"Mind you, we're being careful about how we use adiabatics," he said. "We don't want to be offsetting energy at the expense of water."

City Holdings' Toulson gave a presentation on a recent conversion of an NH₃ cascade refrigeration system to a CO₂ system in a retail application that showed good results.

The original system was an ageing cascade NH₃/CO₂ liquid overfeed system, which was replaced with a fully CO₂ transcritical system linked to a liquid overfeed system.

The end user in this case stipulated an "original requirement to use natural refrigerants at the retrofit site," Toulson explained.

"The replacement resulted in a reduced energy consumption of 32.5% on the main meter or 40% on the refrigeration submeter in kWh."

Highlighting the main benefits of this retrofit, Toulson said, "by removing the NH₃ from the site, the potential risk of the unwanted release of toxic gases was mitigated".

In addition, Toulson stated that the "system performance and stability was improved even in high ambient temperatures of up to 45°C".

Adiabatic pre-cooling again played a key role in this installation, which "helped keep the system running in subcritical mode for a longer time," Toulson explained.

INDEPENDENTS LOOKING TO NATURAL OPTIONS

In a sign that awareness of natural refrigerant systems among the country's independent retailers is increasing, Dave Redden, principal at Refrigeration Innovations, installed Australia's first transcritical CO₂

ejector at a Ritchies IGA supermarket in Beechworth, Victoria, in April 2018.

"Return on investment is a very high priority with smaller independent customers," Redden explained. "They need to see where their dollars are going, and that the cost of actually running the plant can be greater than the actual initial capital cost," he said.

Initial discussions with these smaller independent retailers have shifted from, "What's the upfront cost of the new system?" to "what are the running costs, how much energy can I save, and what is the return on investment?" Redden said.

This has led to closer consideration of increasingly energy-efficient natural refrigerant-based systems among such retailers in recent years.

One of the best examples of this is the CO₂ transcritical installation at the Ritchies supermarket where an R404A system was replaced.

Due to the increasing energy efficiencies seen from incorporating air conditioning and heating into the CO₂ rack, the store was seeing real energy savings that have satisfied the end user.

This is why natural refrigerant systems are rapidly proving their business case, especially among Australia's cost-driven independent retail community.

"They don't look at the bigger picture," said Redden. "They look at their business and what they can do to stay in business, so when you start saving them money and promote sustainability as well, they're very much keen to pass that on to their customers."

Networking sessions were vibrant and lively during the scheduled breaks and end-of-day drinks receptions. For the HVAC&R industry in Australia, it seems, spirits remain high as the sector undergoes rapid change.

■ DY

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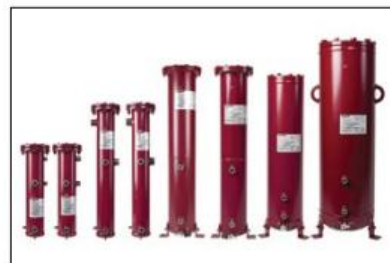
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Movers and shakers recognised with *Accelerate Japan* awards

Across the HVAC&R spectrum, Japanese companies are setting an example for other parts of the world by committing to natural refrigerants. Food retailer Lawson and other key players were recognised for their efforts with inaugural *Accelerate Japan* awards at ATMOSphere Japan 2019.

— By Devin Yoshimoto & Andrew Williams

With Japan having ratified the Kigali Amendment to the Montreal Protocol and the government having confirmed AU\$91.6 million in subsidies for natural refrigerant systems for financial year (FY) 2019 – alongside new and stricter HFC recovery regulations – the stage was set to hear from leading adopters of natural refrigerant technology at this year's ATMOSphere Japan conference, held on 12 February 2019 in Tokyo.

"We're taking a long-term perspective by proactively introducing natural refrigerants," Shinichiro Uto – who heads the store development division at Lawson, a leading Japanese retailer – told the event.

Lawson is aiming to install CO₂ transcritical systems in over 4,000 of its convenience stores by the end of February 2020. By the end of December 2018, it had already installed CO₂ transcritical systems in 3,272 stores across Japan's 47 prefectures.

"As the CO₂ refrigeration market expands, we're endeavouring to advance the HVAC&R industry as a whole by field-testing products from a number of manufacturers," Uto said.

"We're seeking to move towards a multi-supplier system by FY 2020, to establish a stable supply, improve cost-competitiveness, and hedge risks," he added.

Kenji Funamori, a manager in Metro Cash & Carry Japan's asset management department, outlined the company's plans to introduce hydrocarbon technology into stores due to its favourable energy efficiency benefits.

Funamori also pointed to the need for more natural refrigerant solutions for existing store installations. "My message to technology manufacturers is: please try to help us find a solution for our existing stores," he said.

Ajinomoto Frozen Foods, Kokubu Group, Daisen Nyugyo Agricultural Cooperative Association and the Japan Association of Refrigerated Warehouses represented Japan's industrial refrigeration sector at the event.

Ajinomoto Frozen Foods is committed to phasing out HCFCs by 2020 and HFCs by 2030 ([see story on page 40](#)). Other end users in the cold storage industry, such as Kokubu Group, are on a similar path.

"Electricity consumption per square metre of refrigerated warehouse space is reduced by about 30% when using natural refrigerants versus using Freon," according to Kokubu Group's presentation at the event.

FACING PAGE

ABOVE RIGHT

Shinichiro Uto, head of Lawson's store development division.

BELOW RIGHT

From left to right: Stan Mah, Coca-Cola, Shinichiro Uto, Lawson, Tomomitsu Yamasaki, Ajinomoto Frozen Foods, and Syoji Miyajima, Mayekawa.



FIRST-EVER ACCELERATE JAPAN AWARDS

The conference included the first edition of the *Accelerate Japan* awards, which recognise thought leaders in commercial and industrial refrigeration that are doing the most with natural refrigerant solutions in Japan.

Accelerate magazines and ATMOsphere conferences are both produced by shecco, a global market accelerator for natural refrigerant systems.

The Best-in-Sector Light Commercial award went to Coca Cola. In Japan, Coca Cola has been leading the adoption of natural refrigerants in beverage equipment such as bottle coolers and vending equipment. The company aims to be 100% HFC-free in all vending equipment in Japan by 2020.



The Best-in-Sector Food Retail award went to Lawson. As one of the country's leading convenience store operators, Lawson has been driving natural refrigerant adoption in Japan since 2010.

Lawson is leading cost-reduction efforts by working with technology suppliers to test and trial different types of natural refrigerant solution.

The Best-in-Sector Industrial award went to Ajinomoto Frozen Foods.

Ajinomoto Frozen Foods is a division of the Japanese multinational Ajinomoto Co., Inc. – a food and amino science corporation best known for creating the original monosodium glutamate (MSG) product branded 'AJI-NO-MOTO'.

The company has worked to eliminate Freon (a Chemours-branded CFC class) use in all of its domestic food processing factory freezer systems since 2006. The company wants to phase out HFC use in all of its domestic and overseas facilities by 2030.

The winner of this year's Innovation of the Year award was Mayekawa for the NewTon NH₃/CO₂ system.

"We are so surprised and honoured to receive this award. Thank you so much," said Mayekawa's Syoji Miyajima upon receiving the award.

"The point is how can we stop global warming. That is our mission, we believe. The refrigerant issue is of course important, but more than that, it has to be used to reduce energy consumption, so we would like to continue our effort towards that," Miyajima said.

The public chose the Innovation of the Year in an open vote. ■ DY & AW

ABOVE RIGHT

Kenji Funamori,
Metro Cash & Carry Japan.

BELOW RIGHT

Akio Motohashi,
Kokubu Group.



Shaping Refrigeration Systems for Tomorrow

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Premium NH₃ / CO₂ Cooling System

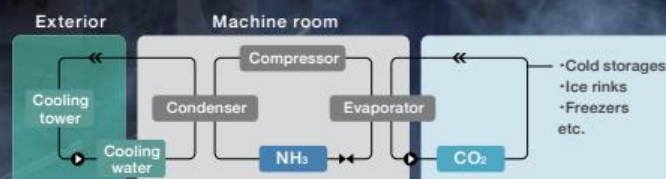
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Emerson hails 'significant' NatRef potential

Tim Flinn, vice-president and managing director of Emerson in Australia and New Zealand, explains why the US-headquartered multinational is excited about the growth potential for natural refrigerants in the region.

— By Andrew Williams & Caroline Rham

Accelerate Australia & NZ: What are the opportunities with natural refrigerants in the Australia and New Zealand markets?

Flinn: They're significant. The big food retailers have made their intentions clear: they are all keen to take advantage of the efficiency benefits of natural refrigerants, as well as the reputational advantages of being seen to be moving towards carbon-neutral.

As with most new technologies impacting the retail sector, the largest players are leading adoption, but we are also already seeing them starting to be adopted by the independent retail sector too. As time progresses, the technology and its implementation will become more affordable.

// Accelerate Australia & NZ: What have you heard from your customers in Australia and New Zealand regarding energy efficiency?

Flinn: Anecdotal feedback from the market and our customers has so far been encouraging, based on installations and performance to date.

We're already seeing our customers roll out their installations more aggressively, with intentions to move to the more tropical areas of the country, as well as outside the key metros into more remote locations.

It's worth noting that energy-efficient performance in hotter and more humid climates is also important for future adoption of this technology beyond Australia and New Zealand. If this technology works well in a climate like Queensland, then it bodes well for adoption in the Southeast Asian market.

// Accelerate Australia & NZ: Which sectors hold the most potential for natural refrigerants?

Flinn: We see the most immediate potential in food retail, with the larger industry players leading the way. These companies generally have the capability to take a long-term view and can also map new technologies like transcritical CO₂ into their new store development plans. As the technology matures, smaller and independent stores will follow.

We also expect demand from the foodservice sector as brands both big and small recognise the need to be seen to be green.

// Accelerate Australia & NZ: What are the biggest challenges in accelerating the transition to natural refrigerant-based technologies?

Flinn: Upfront investment remains a factor, with natural refrigerant-based systems costing approximately 10-15% more than traditional technologies. We are confident, however, that this

will be less of an issue, for three reasons. First, as volumes increase, core equipment costs begin to fall. Second, as more knowledge and experience is gained, installation costs also decrease. Finally, as more data becomes available, the ROI picture becomes even more clear and compelling.

The biggest potential limit to the speed of adoption in markets like Australia and New Zealand is the shortage of qualified technicians. A generation of older electro-mechanical engineers is beginning to leave the workforce, and as an industry, we absolutely need to find and train a new generation of technicians to install and maintain a new generation of cooling technologies.

// Accelerate Australia & NZ: What is Emerson doing about training with natural refrigerants?

Flinn: We're actively partnering with system manufacturers to roll out training, and are providing onsite support with every transcritical installation, training both service technicians and employees. In the process, our commissioning team has become truly world-class.

At a corporate level, we're investing heavily to ensure that our partners and customers have access to state-of-the-art facilities, such as our labs around the region, and can draw on global expertise gained from installations worldwide. ■ AW & CR

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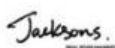
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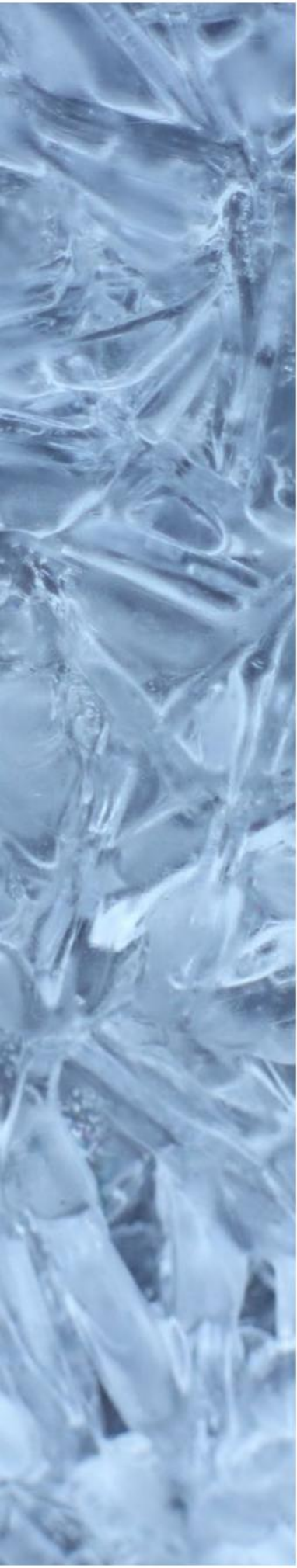
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Serving up a seafood treat

Fung Lea Food, a New South Wales-based importer and processor of seafood and poultry among other products, has opted for an ammonia-CO₂ cascade system to provide the cooling at its combined chicken processing and cold storage facility in Prestons, NSW.

— By Andrew Williams & Caroline Rham

Upon its founding by Mr Sam Tang and Mr Bill Tang in 1987, Fung Lea Food Pty. Ltd. began as a distributor. Fung Lea provided imported seafood products to local restaurants and clubs. It later expanded to poultry, re-processing fresh chicken products for Australia's largest poultry providers.

Working with manufacturers in China and Thailand, Fung Lea offers fish tofu, fish cakes, fish balls and other fish products under the SeAroy brand.

Fung Lea counts multiple, small HFC-based cold stores in Sydney, Melbourne and Brisbane among its HVAC&R inventory. So what motivated the adoption of natural refrigerants?

"The company was looking to consolidate operations into a single plant," Mack Hajjar, projects engineer at Tri Tech Refrigeration Australia (TTRA), told *Accelerate Australia & NZ*.

TTRA designed, installed, commissioned and now maintains the new Fung Lea installation, which employs a cascade system encompassing a GEA Grasso Duo high-side ammonia compressor package; a booster CO₂ compressor rack fitted with GEA Bock compressors; and Witt CO₂ liquid pumps.

The proprietary TTRA system, commissioned in January 2019, delivers 90 kW of cold storage capacity at -20°C and 250 kW of medium-temperature capacity for three chillers at 2°C, a dock at 10°C, a chicken processing area at 8°C, a cool room at 0°C and a process room at 6°C.

"It operates on ammonia as the high-stage refrigeration solution and GEA Bock compressors operating on CO₂ as the booster solution," says Greg Clements, head of sales – compression, at GEA Refrigeration Australia Pty. Ltd.

GEA supplied the ammonia compressors, the CO₂ compressors, the CO₂ oil, the Witt CO₂ liquid pumps, and 3D drawings and documentation for the system.

"Fung Lea wanted CO₂ for perceived efficiency benefits," Hajjar says. "We convinced them to use water-cooled ammonia for the high side of the cascade for improved energy efficiency, improved service life, and lower total cost of ownership."

Among the features that make the system particularly innovative, Hajjar cites a heat recovery circuit for oil cooling and defrost cooling, and the use of the GEA Grasso Duo compressor package in standby configuration.



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ABOVE

The NH₃-CO₂ cascade system encompasses a GEA Grasso Duo high-side ammonia compressor package; a booster CO₂ compressor rack fitted with GEA Bock compressors; and Witt CO₂ liquid pumps.

“We convinced Fung Lea to use water-cooled ammonia for the high side of the cascade for improved energy efficiency, improved service life, and lower total cost of ownership.”

— Mack Hajjar, Tri Tech Refrigeration Australia

The system overall, “is a cost-effective solution for intermediate-size plants that are too small for full-scale ammonia, and too large for Freon,” Hajjar argues.

“It’s an appropriate trade-off between efficiency and cost whilst remaining natural refrigerant-based. It eliminates ammonia from the field, can be scaled up or down, and is entirely appropriate for supermarket applications,” he asserts.

Using a CO₂ rack with only minimal additional features helps to improve the cost effectiveness of the Fung Lea system still further.

With appropriate modifications, the system can generate hot water by virtue of its heat pump and heat recovery functions. It can also be containerised, reducing the footprint of the plant room.

Given that the system was only commissioned in January, a full set of operating performance data is still being acquired.

Yet based on observed operation and power draw, “we expect the energy consumption of the freezer to be approximately 40% that of a similar air-cooled conventional Freon-based installation,” Hajjar predicts.

■ AW & CR

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